ISSN 0253-4924

FOOD TECHNOLOGY *Abstracts*

Vol. 29 No. 6 June 1994

Central Food Technological Research Institute, Mysore
National Information System for Science and Technology
Department of Scientific and Industrial Research, New Delhi.

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FOOD TECHNOLOGY ABSTRACTS

Vol. 29 No. 6
June 1994

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Annual Subscription : Rs.300.00. US $ 90.00. Single Copy : Rs.30.00

FOOD
TECHNOLOGY
ABSTRACTS

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ABBREVIATIONS

A	ampere
AAS	atomic absorption spectrometry
ADP	adenosine diphosphate
Anon.	Anonymous
AOAC	Association of Official Analytical Chemists
approx.	approximately
atm	atmosphere
ATP	adenosine triphosphate
a_w	water activity
BHA	butylated hydroxyanisole
BHT	butylated hydroxytoluene
b.p.	boiling point
Btu	British thermal unit
c-	centi- [as in cm, cm^2, cm^3]
cal	calorie
cd	candela
°C	degree centigrade
Ci	curie
CMC	carboxymethyl cellulose
coeff.	coefficient
conc.	concentrated
concn.	concentration
cv.	cultivar
cwt	hundredweight
d-	deci-
DE	dextrose equivalent
detn.	determination
DFD	dark firm dry
diam.	diameter
dil.	dilute
DM	dry matter
DNA	deoxyribonucleic acid(s)
dyn	dyne
E.	East, Eastern, etc
ECD.	electron capture detection
EDTA	ethylenediaminetetraaceti acid
Eh	oxidation-reduction potential
ELISA	enzyme-linked immunosorbent assay
f-	femto-[10^{-15}, as in fCi]
°F	degree Fahrenheit
FAO	Food and Agricultural Organization
FDA	Food and Drug Administration
FID	flame ionization detection
fl oz	fluid ounce
f.p.	freezing point
ft	foot, feet
g	gram
GC	gas chromatography
gr	gravity
gal	gallon
gf	gram-force
GLC	gas-liquid chromatography
h	hour
ha	hectare
HDPE	high density polyethylene
hl	hectolitre [100 l]
hp	horse power
HPLC	high performance/pressure liquid chromatography
HTST	high temperature short time
Hz	hertz [frequency cycles/s]
in	inch
IR	infrared
IU	international unit
J	joule
k-	kilo- [as in kcalk, kg]
K	Kelvin
l	litre
lb	pound
lbf	pound-force
LDPE	low density polyethylene
m-	milli- [as in mg, ml, mm]
m-	equivmilli-equivalent
M	molar concentration
M-	mega- [as in Mrad]
max.	maximum
min	minute [time]
min.	minimum
mol	mole
mol.wt.	molecular weight
m.p.	melting point
MPN	most probable number
MS	mass-spectrometry
n-	nano-[10^{-9}, as in nm]
N	Newton [kg m/s^2]
N.	North, Northern, etc
N	Normal concentration
NMR	nuclear magnetic resonance
NPU	net protein utilization
oz	ounce
p-	pico- [10^{-12}, as in pCi]
P	Poise
p	probability
Pa	pascal (N/M^2)
PAGE	polyacrylamide gel electrophoresis
PER	protein efficiency ratio
p.p.b.	parts per billion
p.p.m.	parts per million
PSE	pale soft exudative
PTFE	polytetrafluorethylene
PVC	polyvinyl chloride
PVDC	polyvinylidene chloride
qt	quart
R	rontgen
rad	rad or radian
ref.	reference(s)
rev/min	revolutions per minute
RH	relative humidity
RNA	ribonucleic acid(s)
S.	South, Southern, etc.
s.d.	standard deviation
SDS	sodium dodecylsulphate
s.e.	standard error
s	second [time]
SNF	solids-not-fat
sp., spp.	species
sp.gr.	specific gravity
summ.	summary
Suppl.	Supplement
t	metric tonne
temp.	temperature
TLC	thin layer chromatography
TS	total solids
UHT	ultra-high temperature
UV	ultraviolet
V	volt
var.	variety
vol.	volume
v/v	volume/volume
W	watt
W.	West, Western, etc.
WHO	World Health Organization
w/v	weight/volume
wk	week
wt.	weight
yd	yard
yr	year
µ	micro-[as in g, µm]
%	per centum
>	greater than
≥	greater than or equal to; not less than
<	less than
≤	less than or equal to; not greater than

ABBREVIATIONS FOR LANGUAGES

Language of text	
Dutch	Nl
French	Fr
German	De
Italian	It
Japanese	Ja
Norwegian	No
Spanish	E
Swedish	Sv

GENERAL

1012

Shi (Z), Daun (H) and Francis (FJ). **Major anthocyanin from *Tradescantia pallida*: Identification by LSI-MS and chemical analyses.** *Journal of Food Science* 58(5); 1993; 1068-1069

The structure of the main anthocyanin a potential food colorant from *Tr. pallida* was identified by liquid secondary ion MS (LSI-MS) and HPLC as cyanidin-3,7,3-1-triglucoside with 3 molecules of ferulic acid, 1 molecule of caffeic acid and 1 terminal glucose. AA

1013

Fabre (CE), Santerre (AL), Loret (MO), Baberian (R), Pareilleux (A), Goma (G), Blanc (PJ). **Production and food applications of the red pigments of *Monascus ruber*.** *Journal of Food Science* 58(5); 1993; 1099-1102, 1110

Properties of red pigments secreted by *Monascus ruber* in submerged culture were studied, using ethanol and glutamate as C and N sources. After extraction and purification, the colorants were suspended in water for evaluation. Stability of the extract was tested both in sol. and when incorporated into meat products (sausage and pate). Pigments added to sausage or pate remained stable when stored for 3 months at 4°C; stability was between 92 and 98%. Sensory evaluation revealed that *Monascus* pigments could serve as a suitable traditional food additives such as nitrite salts or cochineal. SRA

1014

Gelardi (RC). **Charting the worldwide lite marketplace.** *Manfacturing Confectioner* 73(5); 1993; 41-45

1015

Buisson (DH). **The Asia Pacific food market opportunities and challenges.** *Manfacturing Confectioner* 73(2); 1993; 39-40, 42-44

Major economic and social changes taking place in the Asia Pacific rim countries in relation to their impact on the food industry and on future food marketing opportunities for Western countries are discussed. These trends include: increased urbanization and the resulting demand for convenience foods; changes in the typical Asian diet (more westernized tastes); emphasis on health; and changing trade restrictions. CSA

1016

Valverde (ME) and Paredes (L-O). **Production and evaluation of some food properties of huitlacoche (*Ustilago maydis*).** *Food Biotechnology* 7(3); 1993; 207-219

Huitlacoche (a Mexican edible delicacy, comprising the smut gall caused by the fungus *Ustilago maydis* growing on corn ears); are prepared and consumed in a similar manner to common mushrooms. Studies were conducted on composition of 3 samples of *huitlacoche*; naturally-occurring samples from the Toluca and Pachuca areas of Mexico and a sample prepared by inoculation of corn ears with *U. maydis*. Data are given for proximate composition, amino acid composition and fatty acid composition; samples were also tested for mycotoxins. No sample contained aflatoxins, ochratoxins or zearalenone. Moisture content ranged from 91.6 to 93.2 g/100 g fresh wt. basis. Mean values for proximate composition were (g/100 g DM basis): crude protein 11.5-14.1; true protein 9.7-12.4; fat 1.6-2.3; ash 5.2-7.0; crude fibre 16.0-23.5; and carbohydrates (by difference) 55.1-66.5. Lysine content was relatively high (6.3-7.3 g/100 g protein). The predominant fatty acids were linoleic acid (38.7-48.4%), linolenic acid (38.7-48.4%), linolenic acid (13.0-14.6%). Differences in composition between samples from the 3 sources studied are considered. BV

FOOD PROCESSING

1017

Kim (H-J) and Taub (IA). **Intrinsic chemical markers for aseptic processing of particulate foods.** *Food Technology* 47(1); 1993; 91-97, 99

The compounds intrinsically produced from foods upon thermal processing are useful for validating the sterility of aseptically processed

particulate foods is described in this article. CSA

FOOD PACKAGING

Packaging materials

1018
Srivastava (MK) and Chopra (S). **Good quality polyethylene prerequisite for the performance of drop-test.** *Indian Dairyman* 46(5); 1994; 251-254

Drop test is simple, convenient, easy and practical to judge the quality of polyethylene film and also seal strength to be ascertained for better storage and transportation. Pouches made from the polyethylene having uniform thickness and tensile strength and enlongation break % as per BIS norms and filled with milk performed good in drop-test. GS

FOOD ENGINEERING AND EQUIPMENT

1019
Chen (SD), Ofoli (RY), Scott (EP) and Asmussen (J). **Volatile retention in microwave freeze-dried model foods.** *Journal of Food Science* 58(5); 1993; 1157-1161

Microwave freeze-drying required shorter drying times and leads to higher volatile retention levels than conventional freeze-drying. Pregelatinized corn starch solutions (8% solids) were mixed with 500 p.p.m. each of 1-hexanol, 1-decanol and D-limonene and subjected to 3 treatments: control, addition of 4% β-cyclodextrin and addition of 4% sucrose. Samples were frozen at -15, -60 or -198°C and freeze-dried at a microwave power of 10 W and a cavity pressure of 1 or 2 torr. Results showed that sample composition significantly affected both drying rate and volatiles retention. Samples containing β-cyclodextrin had higher levels of volatile retention than other treatments, probably due to inclusion complex formation and shorter drying times. Samples frozen at -15°C had higher levels of volatile retention. Freeze-drying of samples at 1 torr resulted in higher final moisture contents than at 2 torr, but no appreciable differences in volatiles. SRA

Equipments

1020
Anon. **The Buhler continuous fresh air roaster, type STT.** *Confectionery Production* 59(3); 1993; 198-199

Discusses the use of Buhler continuous fresh air roaster type STT for uniform roasting of cocoa beans, nibs and nuts. Aspects considered are: products treated by the Buhler STT roaster; gentle handling of the product; regularity of roast; hygienic design and easy maintenance; exact process control; energy conservation; and use of heating media (other than steam). CSA

ENERGY IN FOOD PROCESSING

Nil

FOOD CHEMISTRY AND ANALYSIS

Chemistry

1021
Chinachoti (P). **Water mobility and its relation to functionality of sucrose - containing food systems.** *Food Technology* 47(1); 1993; 134-140

The article provides a review of the current understanding of the complex behaviour of water in solute-polymer systems from various physicochemical studies such as water mobility and phase transition. The physical state of sucrose affects the mobility of water in a food system and thus affects the properties of the system and the potential for food spoilage. 69 references. CSA

1022
Kocher (PN) and Foegeding (EA). **Microcentrifuge-based method for measuring water-holding of protein gels.**

Journal of Food Science 58(5); 1993; 1040-1046

Reports a method developed to measure water-holding properties of protein gels which provided high precision and expanded analysis. A cylindrical gel sample was placed in an inner cell (which at its base contained a filter membrane) of a commercial microfiltration unit. The unit was then spun in a horizontal rotor microcentrifuge. Rates of water loss and degree of compression were determined. The rate of water loss could be modelled as the summation of 2 exponential decay functions. Degree of compression correlated with held-water. Gel rehydration ability and microstructure were used to study effects of centrifugal compression on gel structure. SRA

1023

Hayakawa (I), Yamada (Y) and Fujio (Y). **Microparticulation by jet mill grinding of protein powders and effects on hydrophobicity.** *Journal of Food Science* 58(5); 1993; 1026-1029

A method for microparticulation of protein for use as fat substitutes by superfine grinding (SG) was studied and hydrophobicity of the microparticulated proteins was evaluated. A stainless steel jet mill equipped with 6 jet nozzles was used for SG. The mill was operated at 7.0 kgf/cm^2 G air pressure and 7.5 Nm^{3}min air vol. at room temp. Egg white (EW) was ground once at a feed rate of 0.92 kg/h. Casein was ground twice at 1.142 and 0.96 kg/h and Soybean hull (SH) was ground twice at 0.80 and 0.45 kg/h. The mill produced particles less than 3 μm from EW, casein and SH. Microparticulation by grinding of EW was easier than with casein or SH. Hydrophobicity of casein increased by grinding to superfine particles but no significant effect was observed on SH or EW. BV

1024

McClements (DJ), Dungan (SR), German (JB), Simoneau (C) and Kinsella (JE). **Droplet size and emulsifier type affect crystallization and melting of hydrocarbon-in-water emulsions.** *Journal of Food Science* 58(5); 1993; 1148-1151, 1178

Effects of emulsifiers and droplet size on phase behaviour of oil droplets stabilized by small surfactants and milk proteins were examined. DSC was used to monitor crystallization and melting of 20 wt.% n-hexadecane oil-in-water emulsions. The temp. at which droplet crystallization occurred depended on type of emulsifier used to stabilize the droplets: sodium caseinate, whey protein isolate, Tween 20, 40, 60 and 80 or SDS. Emulsifiers with hydrocarbon tails close in structure to n-hexadecane promoted crystallization at higher temp., which suggested that emulsifier molecules at the interface acted as nucleation sites for oil. Smaller droplets crystallized at a slower rate than larger droplets. Droplet size and emulsifier type had no appreciable effect on melting behaviour of the droplets. SRA

1025

Barletta (BJ) and Barbosa Canovas (-GV). **Fractal analysis to characterize ruggedness changes in tapped agglomerated food powders.** *Journal of Food Science* 58(5); 1993; 1030-1035, 1046

Samples of commercial instant coffee and instant skim milk powders were exposed to attrition in a tap density tester. Digital images of the projected outlines of individual particles were obtained and the fractal dimension of their profiles was computed with 3 different algorithms. Results show that the mean apparent practical value of the agglomerates varied with the number of tappings. SRA

1026

Bakhit (R) and Schmidt (S). **Sorption behavior of mechanically mixed and freeze-dried sucrose/casein mixtures.** *Journal of Food Science* 58(5); 1993; 1162-1165

Interactions between sucrose and casein were investigated by adsorption isotherms. Mechanically mixed and freeze-dried sucrose/casein mixtures at sucrose 1, 5, 10, 15 and 20% (wet basis) were compared to calculated isotherms using the mass balance equation, over the a_w range 0.23-0.93 at 20°C. Mechanical mixtures did not exhibit solute/polymer interactions. Freeze-dried systems showed positive interaction (i.e. sorbed more water than calculated) for 1 and 5%

sucrose at all a_w values. For the 10, 15 and 20% sucrose mixtures, positive interaction continued below 0.86 a_w; however, above 0.86 a_w, no interaction was apparent, i.e. experimental sorption values equalled calculated values. BV

1027

Arteaga (GE) and Nakai (S). **Predicting protein functionality with artificial neural networks: foaming and emulsifying properties.** *Journal of Food Science* 58(5); 1993; 1152-1156

Using physicochemical properties of ribonuclease-A, ovomucoid, trypsin, lysozyme, pepsin, conalbumin, ovalbumin, bovine serum albumin, kappa-casein, beta-lactoglobulin and beta-casein, artificial neural networks (ANN) were developed for predicting foam capacity (FC) and stability (FS) and emulsion activity index. Prediction accuracy of ANN was compared to that of principal component regression (PCR) models. ANN had better prediction ability than PCR, especially after cross-validation. For FS, PCR did not generate a significant model. ANN and PCR models indicated that fluorescence probe hydrophobicity (measured using cis-parinaric acid) and other properties, such as viscosity, surface tension and net charge were important in predicting FC and FS. SRA

1028

Buhri (AB) and Singh (RP). **Measurement of food thermal conductivity using differential scanning calorimetry.** *Journal of Food Science* 58(5); 1993; 1145-1147

To measure thermal conductivity of foods (rutabagas, radish, parsnip, turnip, potato, apple, carrot, nonfat dry milk, sugar, wheat flour), an attachment to a differential scanning calorimeter was constructed. A needle probe with a 40 gauge type-T thermocouple was used to measure the temp. of a cylindrical food sample. The differential scanning calorimeter heating pan temp. was maintained at 40°C for 5 min and then raised to 50°C. The average thermal conductivities of rutabagas, radish, parsnip, turnip, potato, green apple and carrot were 0.447, 0.499, 0.392, 0.480, 0.552, 0.405 and 0.564 W/m°C, respectively, for a temp. range between 40 and 50°C. It was concluded that the DSC method was reliable, precise, and a relatively rapid technique for determining thermal conductivity of foods. AA

1029

Stecchini (ML), Giavedoni (P), Sarais (I) and Lerici (CR). **Antimicrobial activity of Maillard reaction products against *Aeromonas hydrophila*.** *Italian Journal of Food Science* 5(2); 1993; 147-150

Growth response and metabolic activity of *Aeromonas hydrophila* in the presence of Maillard reaction products (MRP), prepared by heating a glucose-glycine solution at pH 8.8, were investigated. A gradual increase in antibacterial action of MRP was observed with increase in heating time of glucose-glycine solutions. For shorter heating times, a stimulating effect on growth was noticed, which was probably due to the unreacted glucose. Growth of A. hydrophila was significantly inhibited in the presence of MRP when loss of glucose involved in the Maillard reaction was > 40%. AA

1030

Nicoli (MC), Anese (M) and Lerici (CR). **Influence of pH on the kinetics of non-enzymatic browning in heat-treated glucose-glycine model systems.** *Italian Journal of Food Science* 5(2); 1993; 139-146

Influence of pH on rate of browning of a glucose-glycine model system was studied. Glucose and glycine loss, changes in absorbance and headspace CO_2 production were used as indicators of the development of the Maillard reaction. Rate of browning of the sugar-amino acid systems increased with increasing pH; in particular, a remarkable increase in the rate constant of glucose and glycine loss was observed between pH 8 and 10. AA

1031

Anese (M), Pittia (P) and Nicoli (MC). **Oxygen consuming properties of heated glucose/glycine aqueous solutions.** *Italian Journal of Food Science* 5(1); 1993; 75-79

The oxygen uptake of Maillard reaction products (MRP) formed from glucose/glycine solutions heated at 90°C for different times was studied using an oxygen electrode. Oxygen consumption increased as the heating time increased. The oxygen consuming properties of MRP were not found to be linearly related to the MRP concn. AA

1032

Thakur (BR), Singh (RK) and Arya (SS). **Chemistry of sorbates - a basic perspective.** *Food Reviews International* 10(1); 1994; 71-91

This report reviews and summarizes the degradation of sorbic acid (SA) in aqueous and model food systems, degradation in food systems, factors influencing degradation of SA (pH, antioxidants, transitional metal ions, other salts), sugar and glycerol, ascorbic acid, amino acids and proteins, a_w, packaging, temp., irradiation and microbial degradation) and role of non-enzymic browning reactions in these systems. 110 references. SRA

FOOD MICROBIOLOGY AND HYGIENE

Fermentation

1033

Delaquis (PJ), Fontaine (J), Dussault (F) and Champagne (CP). **Maple syrup as carbohydrate source in dry sausage fermentation.** *Journal of Food Science* 58(5); 1993; 981-982, 990

Potential use of Maple syrup (MS) as a carbohydrate source in the manufacture of dry sausage was investigated. MS was substituted for the glucose-sucrose (GS) component of a standard dry sausage formulation. Sausage batters containing either type of carbohydrate were inoculated with a mixed starter culture containing *Lactobacillus plantarum*, *Pediococcus acidilactici* and *Micrococcus varians*. Similar acidification patterns were observed in fermenting batters containing GS mixtures or MS, and processing yields were unaffected by carbohydrate type. However, instrumental texture measurements (shear and compression forces) revealed that sausage made with MS was significantly firmer than the standard product (P less than or equal to 0.05). It was concluded that MP could be used in the manufacture of novel fermented meat products. SRA

1034

Berg (DJC), Smits (A), Pot (B), Ledeboer (AM), Kersters (K), Verbakel (JMA), Verrips (CT). **Isolation, screening and identification of lactic acid bacteria from traditional food fermentation processes and culture collections.** *Food Biotechnology* 7(3); 1993; 189-205

This study describes a search for lactic acid bacteria (LAB) capable of exo-polysaccharide (EPS) production or exhibiting antimicrobial or proteolytic activities. Approx. 400 LAB were isolated from traditional fermented foods (sourdough, sausages, table olives, cheese and other dairy products). Together with almost 200 LAB strains from culture collections, these strains were screened for EPS production, bacteriocin production and proteolytic activity. 30 strains producing EPS and 8 *Lactococcus lactis* strains producing a nisin-like bacteriocin were selected. Proteolytic activities of all strains were determined, using a test based on casein degradation. As a result, a division was made into 4 groups with increasing proteolytic activities. Among the EPS-producing strains, 14 were isolated from various olive fermentations, all identified as *Lactobacillus paracasei*. EPS-producing strains isolated from Belgian salami were characterized as being closely related to *Lact. sake*. Another 10 EPS-producing strains were obtained from culture collections. AA

Microorganisms

Bacteria

Lactobacillus helveticus

1035

Norton (S), Lacroix (C) and Vuillemard (JC). **Effect of pH on the morphology of *Lactobacillus helveticus* in free-cell batch and immobilized-cell continuous fermentation.** *Food Biotechnology* 7(3); 1993; 235-251

The effect of pH control set point in the range 4.3-6.3 on morphology of *Lact. helveticus* [strain L89 Institut Rosell Inc., Montreal, Canada] was studied in free-cell batch and immobilized-cell continuous fermentations [ICCF] using a supplemented whey permeate medium. Mean chain length of *Lact. helveticus* was measured by microscopic observation in both free and entrapped phases. In free-cell batch fermentation, chain elongation of *Lact. helveticus* occurred progressively when pH set point was in the range 5.1-6.3. During ICCF, morphology was much less pH-dependent. This phenomenon could be due to the long response time of entrapped cells to daily random changes in pH set point. Bacterial counts, dry wt. and optical density measurements were compared in order to develop a methodology to ensure accurate biomass measurement in the different phases of the immobilized-cell bioreactor. BV

Fungi

1036
Rane (KD) and Hoover (DG). **Production of chitosan by fungi.** *Food Biotechnology* 7(1); 1993; 11-33

Production of chitosan (a novel biopolymer with industrial and food applications) from mycelia of *Absidia coerulea*, *Mucor rouxii*, *Gongronella butleri*, *Phycomyces blakesleeanus* and *A. blakesleeana* was studied. In batch culture, strains were screened to determine the fastest growing and greatest chitosan-yielding fungi. Optimum chitosan yields were observed for most cultures at 21 and 26°C in 1% yeast extract, 0.4% glucose and 0.3% peptone. *A. coerulea* ATCC 14076 and NRRL 1315 were the best producers of chitosan of the strains examined. Chitosan yields of *A. coerulea*, *M. rouxii*, *G. butleri*, *P. blakesleeanus* and *A. blakesleeana* were 47-50, 29-32, 21-25, 6 and 7 mg/100 ml of medium, respectively. Degree of acetylation of chitosan ranged from 6 to 15%; the lowest was from strains of *A. coerulea*. Viscosity av. mol. wt. of fungal chitosans were equivalent at approx. 4.5×10^5 Da. *A. coerulea* 14076 yielded the most chitosan, 51 mg/100 ml of medium at pH 5.5 in 48 h. Supplementation with 0.5 mg/100 of cobalt/100 ml medium showed an increase of approx. 20% in the chitosan yield from *A. coerulea* 14076. Batch fermentations were carried out in flask, airlift and stirred tank fermentors. Fermentation by continuous culture in the stirred tank reactor produced the highest amount of chitosan from *A. coerulea* 14076 resulting in an approximate 3-fold increase in chitosan production as compared to batch culture. BV

Aspergillus foetidus

1037
Hung (C-C). **Citric acid production by *Aspergillus foetidus* in batch and fed-batch cultures.** *Food Biotechnology* 7(3); 1993; 221-234

Sucrose and ammonium nitrate, respectively, were the preferred C and N sources for citric acid (CA) production by *Asp. foetidus* CCRC 30206. For a 7-day fermentation, max. CA production of 7.2-28.4 g/l appeared at an initial sucrose concn. of 12% under various initial levels of N and P sources. CA production commenced and ceased earlier in either the N-limited (NH_4NO_3, 0.5 g/l) or P-limited (KH_2PO_4, 0.2 g/l) medium. Richer media delayed the onset of CA production. 48.3 g/l CA was produced in a medium rich in N (NH_4NO_3, 2.0 g/l) and P (KH_2PO_4, 1.4 g/l) when the batch culture was extended to 16 days. Cultivation time of this rich medium was reduced to 12 days in a fed-batch culture under dual limitation of both N and P. AA

Aspergillus oryzae

1038
Ray (L) and Majumdar (SK). **Production of cellulases and β-glucosidase by *Aspergillus oryzae* and enzymatic saccharification of some cellulosic wastes.** *Research and Industry, India* 39(2); 1994; 105-108

Asp. oryzae grown in solid state fermentation produces carboxymethyl cellulase, filter paper degrading enzyme, and β-glucosidase with optimum activity of each enzyme component of pH 4.8 and 60°C. The organism is found to be a rich source of β-glucosidase (12.59 IU/ml). Glucose inhibits the β-glucosidase activity. Cysteine has stimulatory effect on the activity of cellulase components. Treatment of 2% rice

straw (alkali-treated) with the mold culture filtrate at pH 4.8 and 60°C gives 59.85% saccharification in 72 h. AA

Rhizopus delemar

1039

Haas (MJ) and Bailey (DG). **Glycerol as a carbon source for lipase production by the fungus *Rhizopus delemar*.** *Food Biotechnology* 7(1); 1993; 49-73

The ability of the fungus *Rhizopus delemar* to sythesize lipase (glycerol ester hydrolase, E.C. 3.1.1.3) when grown on glycerol as the prime C source was investigated. Glucose, glycerol and olive oil all supported fungal growth and lipase production. Max. net and specific lipase activities obtained in glycerol were greater than those obtained in glucose and olive oil, and were reached earlier and maintained longer during growth. In glucose media, lipase activity did not appear until the glucose had been consumed. Differences in lipase activity between glycerol and glucose media were not due to pH-mediated lipase inactivation. In both glucose and glycerol media, the appeareance of lipolytic activity coincided with the appearance of lipase polypeptide. The data are consistent with the suggestion that lipase synthesis is subject to catabolite repression by glucose. These studies identify a simple, single-phase medium for lipase production and establish the utility of glycerol for amplifying enzyme levels. AA

BIOTECHNOLOGY

1040

Yogamoorthi (A). **Biotechnological developments and aquaculture prospects.** *Seafood Export Journal* 25(15); 1994; 9, 11, 13, 15, 17-18

Outlines the current trends in bio-tech application in aquatic animals; the need for international cooperation and the involvement of private and government sectors to ensure rapid advancement in marine biotechnological research and the progress in cell culture, cell fusion, cell organ transference and selection of mutant as future achievements in bioengineering. GS

1041

Cho (YH) and Knorr (D). **Development of a gel and foam matrix as immobilization system for cells for microbial denitrification of water.** *Food Biotechnology* 7(2); 1993; 115-126

An anaerobic denitrifying bacterium, *Paracoccus denitrificans* DSM 65, was used as a model organism for immobilization of microbial cells in a gel and foam matrix (GFM) system. Polyurethane foam cubes were soaked with a suspension of *P. denitrificans* in 3% alginic acid solution and then hardened in 0.1M $CaCl_2$ sol. The rate of nitrate reduction by *P. denitrificans* DSM 65 was determined by anaerobic incubation of the cells immobilized in GFM using water containing KNO_3 as substrate and sodium acetate as carbon source. Screening for optimum immobilization conditions was performed in shake flask cultures at 38°C under anaerobic conditions. A pore density of 20 pores per inch (PPI) and a cube size of 1 x 1 x 1 cm was identified as optimum for nitrate and nitrite reduction. Crushing of the gel matrix by uniaxial compression was an effective means for enhancement of denitrification. The GFM system may be applicable to denitrification of drinking water liquid foods as well as in waste water treatment. BV

1042

Hari (RK), Patel (TR) and Martin (AM). **An overview of pigment production in biological systems: Functions, biosynthesis, and applications in food industry.** *Food Reviews International* 10(1); 1994; 49-70

This review deals with pigments or biochromes, the chemical compounds absorbing specific wavelengths of visible light. A broad spectrum of pigments produced in the biological systems are reviewed in relation to their distribution and occurrence in the living world as well as the types, functions, and applications of the pigments in industry and aquaculture. In the last part, attention is focused on the mechanisms of their biosynthesis. 89 references. SRA

TISSUE CULTURE

Nil

FOOD ADDITIVES

Bulking agents

1043
Ranhotra (GS), Gelroth (JA) and Glaser (BK). **Usable energy value of selected bulking agents.** *Journal of Food Science* 58(5); 1993; 1176-1178

Usable energy value (calorific value) of 4 bulking agents (BA) (white wheat fibre (WF), polydextrose, isomalt and oligofructose) were evaluated using young rats as the test model. The net increase observed in carcass energy due to BA fed over a 3-wk period was evaluated. WF contained 0.9, polydextrose 0.8, isomalt 1.6 and oligofructose 1.5 calories/g. As a partial substitute for sugar, fat and/or flour, these BA could effectively reduce the energy content of foods. BV

Sweeteners

1044
Giese (JH). **Alternative sweeteners, and bulking agents.** *Food Technology* 47(1); 1993; 114-115, 118, 120-122, 124-126

Presents an overview of the characteristics, application and regulatory status of alternative sweeteners (saccharine, cyclamates, acesulfame-k, aspartame, peptide sweeteners, thaumatins, stevioside and rebaudiosides, glycyrrhizin, sucralose, dihydrochalones, L-sugars), the use of a bulking agent along with alternative sweeteners in certain food systems such as baked goods, confections and frozen desserts to provide the functions other than sweetness normally associated with sucrose. The article also discusses the features and uses of the alternative caloric or bulking compounds (cellulose, polydextrose, polyols). CSA

1045
Anon. **'Fructsweet' - a sugar alternative.** *Confectionery Production* 59(5); 1993; 419

Fructsweet, a combination of the artificial sweeteners aspartame and acesulfame K with selected fruit concentrates which has a natural and sugar-like taste and can deliver up to 80% reduction in calorie content in most applications is discussed. Fructsweet is supplied as a yellow/brown viscous liquid, with an av. shelf-life of 6 wk and a calorie count of 2.5 kcal/g and can be used as a sugar alternative in products like low-calorie drinks, yoghurts and dairy desserts. CSA

CEREALS

1046
Dahlin (KM) and Lorenz (KJ). **Carbohydrate digestibility of laboratory-extruded cereal grains.** *Cereal Chemistry* 70(3); 1993; 329-333

Whole-grain cereals (wheat, rye, corn, millet and low- and high-tannin sorghum) and quinoa were examined to determine the effects of lab. extrusion processing on in vitro carbohydrate digestibility. Extrusion variables included cereal var., extrusion temp., screw speed and feed moisture. Samples were incubated with human saliva, and products of digestion were quantified spectrophotometrically. Extrusion product temp. of 100/150°C had the greatest influence on improving in vitro carbohydrate digestibility for all cereals studied, as did 25% feed moisture and 100 rpm screw speed. Improving carbohydrate digestibility during extrusion processing appears to depend very strongly upon cereal type. Further studies are needed to assess optimal processing conditions for improved carbohydrate digestibility of particular cereal grains. AA

1047
Doernenburg (H) and Knorr (D). **Cellular permeabilization of cultured plant tissues by high electric field pulses or ultra high pressure for the recovery of secondary metabolites.** *Food Biotechnology* 7(1); 1993; 35-48

Chenopodium rubrum and *Morinda citrifolia* cells were subjected to high electric field pulses (0 to 1.6 kV cm^{-1}, 0 to 30 pulses) or high hydrostatic pressure (0.1 to 350 MPa, 10 min, RT) to examine their role in cell permeabilization. A max. amount of 85% of the total amaranthin content and 5.7% of total amount of anthraquinones of the cells could be released after treatment with electric field pulses. However, cell viability was lost at release values higher than 16 and 2%, respectively. Pressure treatment at 350 MPa resulted in pigment releases of 99 and 9.4%, respectively. Viability was lost at pressures of 110 and 75 MPa, respectively. Although the methods applied have limited potential for cell permeabilization while preserving cell viability, they are proposed as useful processes for metabolite recovery. AA

1048

Wrick (KL). **Functional foods: Cereal products at the food-drug interface.** *Cereal Foods World* 38(4); 1993; 205-206, 208, 210, 212, 214

The author introduces the concepts of food-drug interface, discusses some cereal ingredients and products that fall within the interface and the marketing of these foods, as well as the challenge such foods may pose to public health policy. CSA

Barleys

1049

Bason (ML), Ronalds (JA), Wrigley (CW) and Hubbard (LJ). **Testing for sprout damage in malting barley using the rapid visco-analyser.** *Cereal Chemistry* 70(3); 1993; 269-272

The ability of the Rapid Visco-Analyser (RVA) to detect sprout damage was assessed using 7 cv. of Australian malting barley. The RVA stirring number (SN, viscosity at 3 min) correlated well with falling number, α-amylase levels, and the subsequent life span of the grain. Sprout damage in malting barley could be reliably detected using the RVA SN method. The relationship between SN and retention of acceptable viability in storage for malting was used to devise a method for determining threshold SN values to indicate whether a sample is sound or damaged. Suggested cut-off values, below which a sample could be classified as damaged, ranged between 120 and 150 Rapid Visco units, depending on cv. AA

1050

Eerlingen (RC), Deceuninck (M) and Delcour (JA). **Enzyme-resistant starch. II. Influence of amylose chain length on resistant starch formation.** *Cereal Chemistry* 70(3); 1993; 345-350

Potato starch amylose was hydrolysed to varying degrees by incubation with barley β-amylase for different periods. Detn. of reducing sugars and gel-permeation chromatography showed that amylose fractions with different number av. chain lengths (degree of polymerization (DP_n) 40-610) were obtained. Enzyme resistant starch RS was formed from the fractions in aqueous sol. (0.83%, w/v) at 4°C. Under experimental conditions, the yield of RS increased with DP_n to plateau values of 23-28% within a region of DP_n of 100-610. X-ray diffraction showed a B-pattern for all RS samples obtained. The DP_n of RS varied only between 19 and 26 and, thus, it is independent of the chain length of the amylose from which it was formed (DP_n 40-610). Results suggest that RS may be formed by aggregation of amylose helices in a crystalline B-type structure over a particular region of the chain (about 24 glucose units). AA

1051

Eerlingen (RC), Crombez (M) and Delcour (JA). **Enzyme-resistant starch. I. Quantitative and qualitative influence of incubation time and temperature of autoclaved starch on resistant starch formation.** *Cereal Chemistry* 70(3); 1993; 339-344

Wheat starch was autoclaved (121°C) for 1 h in excess water. Subsequent formation of enzyme-resistant starch (RS) was studied as a function of time (at different incubation temp. of 0, 68 and 100°C). Rate of formation and max. yields of RS (4, 6 and 10%, respectively) varied to a great extent. The relationship between incubation time, temp. and yields of RS was interpreted in terms of crystallization in an

amorphous matrix, the starch gel being a partially crystalline polymer system. Upon incubation at 0°C, nucleation rate was high and propagation rate was low; the opposite was the case upon incubation at 100°C. At 68°C, an intermediate pattern was observed. Incubation of the autoclaved starch samples at 2 subsequent temp. (0 and 68°C or 0 and 100°C, 2-step procedure) did not increase the RS yield significantly. X-ray diffraction showed qualitative differences among crystallites formed at different temp. RS formed at 100°C (A pattern) was different from that formed by incubation at 0 or 68°C (B pattern). X-ray diffraction of RS formed in a process with 2 storage steps at different temp. (0 and 68°C or 0 and 100°C), aiming at increasing yields by first favouring nucleation and then propagation, yielded B-type diffractograms. AA

Quinoa

1052

Ranhotra (GS), Gelroth (JA), Glaser (BK), Lorenz (KJ) and Johnson (DL). **Composition and protein nutritional quality of quinoa.** *Cereal Chemistry* 70(3); 1993; 303-305

Dehulled quinoa (*Chenopodium quinoa* Willd.) flour (Colorado D407) contained greater than 58% starch, 15.6% protein (N x 6.25), 2.7% sugars, 8.9% total dietary fibre and nearly 7% lipids and ash. The proportion of soluble fibre was only 13.5% of total dietary fibre. Quinoa was rich in several micronutrients, especially K, Fe, Ca and riboflavin. The lysine level in quinoa protein (6.3%) was comparable to that of soybean and was typical of dicotyledonous seed protein in being deficient in methionine. Based on animal studies (PER, protein digestibility and nitrogen balance), the quality of protein in quinoa matched that of casein. CSA

Rice

1053

Gupta (SC) and Sharma (KD). **Genetic studies on the mutagen induced variability for some quality characters in rice.** *Madras Agricultural Journal* 81(4); 1994; 205-206

Three rice var. (HPU 734, Himdhan and Madhu Malti) and F_2 seeds of two crosses (HPU 734/Himdhan and HPU 734/Madhu Malti), were subjected to mutagenic treatments viz. ethyl methane sulphonate (0.5 and 1.0%) and gamma ray (25 and 35 KR). Protein % increased in all 3 var. but decreased in both the crosses as compared to their controls. GS

1054

.Eggum (BO), Juliano (BO), Perez (CM) and Khush (GS). **Starch, energy, and protein utilization by rats in milled rice of IR36-based amylose extender mutant.** *Cereal Chemistry* 70(3); 1993; 275-279

Utilization of starch, energy and protein from cooked milled rice of amylose extender (ae) mutant 2064 and its IR36 parent was examined in growing rats. Despite the higher lysine content of the ae mutant (3.83 vs. 3.32 g/16 g of N), NPU and protein quality of both rices were comparable because of the lower protein, energy and starch digestibility of the mutant. Starch, energy and protein digestibility of the mutant decreased progressively from raw to cooked to cooked-parboiled, with or without addition of the antibiotic Nebacitin (used to suppress hindgut fermentation) in the diet. Unlike the same ae mutants in corn, the rice ae mutant did not have a considerable increase in resistant starch with increased amylose content. AA

Ryes

1055

Vinkx (CJA), Reynaert (HR), Grobet (PJ) and Delcour (JA). **Physicochemical and functional properties of rye nonstarch polysaccharides. V. Variability in the structure of water-soluble arabinoxylans.** *Cereal Chemistry* 70(3); 1993; 311-317

Subsequent increases in the degree of ammonium sulphate saturation of a rye water extract allowed precipitation of at least 3 distinct arabinoxylan fractions that differed markedly in mol. wt. distribution and fine structure. A first (main) fraction, precipitated between 25 and 50% saturation, had an arabinose-to-xylose ratio (A/X) of 0.5 with virtually all branched xylose residues

substituted at O-3 with arabinose (as shown by 500 MHz ^{1}H-NMR). This fraction contained ferulic acid (0.04-0.07%), had a lower mol. wt. than the other fractions, and gelled oxidatively with the hydrogen peroxide-peroxidase system. A second (small) fraction had an A/X of 1.4 and precipitated between 75 and 100% ammonium sulphate saturation. It did not gel. All branched xylose residues were substituted at both O-2 and O-3 with arabinose. Structures of 1, 2 and more consecutive, disubstituted xylose residues in the xylan chain could be recognized in the ^{1}H-NMR spectra. Fractions precipitating between 50 and 75% ammonium sulphate saturation were not mixtures of these 2 arabinoxylan fractions because the ^{1}H-NMR spectra showed differences in the ratio of isolated to paired disubstituted xylose residues. AA

1056

Vanhamel (S), Cleemput (G), Delcour (JA), Nys (M) and Darius (PL). **Physicochemical and functional properties of rye nonstarch polysaccharides. IV. The effect of high molecular weight water-soluble pentosans on wheat-bread quality in a straight-dough procedure.** *Cereal Chemistry* 70(3); 1993; 306-311

Addition of 2% high mol. wt. rye water-soluble pentosans to European bread wheat flour greatly changed its rheological and functional breadmaking properties. When rye fractions were added as dry powder, changes in mixograph curves were smaller than changes of fractions that were presoaked in water and then added. Under the latter conditions, mixograph peak height and area under the curve were greatly increased. Response surface methodology showed that loaf vol. of breads obtained from wheat flour is strongly dependent on mixing time and water addition. Addition of rye components as a fine powder to wheat flour increased water absorption level and range of mixing times for obtaining a bread of constant loaf vol. and crumb quality. At the same time, it was possible to incorporate more water and mix for a longer time without impairing the dough handling properties. Loaf vol. increased and crumb structure was comparable to that of the control. When high mol. wt. water solubles from rye were presoaked and added as a sol., the range of mixing times and the water absorption level were further increased. Mixing time and water absorption level strongly influenced loaf vol. The rye components used in this study influenced the quality of the wheat flour. AA

Wheat

1057

Bhirud (PR) and Sosulski (FW). **Thermal inactivation kinetics of wheat germ lipoxygenase.** *Journal of Food Science* 58(5); 1993; 1095-1098

Thermal inactivation curves for wheat germ lipoxygenases (LPO) in partially purified and crude extracts were determined in capillary tubes at 60-68°C. The biphasic curves fitted a 2-fraction 1st-order model suggesting the presence of 2 groups of isozymes. At 60°C, the inactivation rate constants were 9.112×10^{-5} s^{-1} and 9.174×10^{-6} s^{-1}, respectively, for thermolabile phase I and thermostable phase II in the partially purified extract, a difference of 1 order of magnitude. For the temp. change from 60 to 68°C, the rate constants increased by 3 orders of magnitude, implying a very high sensitivity (for LPO inactivation in partially purified extract ΔH = 646261 J $mole^{-1}$, ΔS = 1619 J $mole^{-1}$ K^{-1} for phase I, ΔH = 546099 J $mole^{-1}$, ΔS = 1298 J $mole^{-1}$ K^{-1} for phase II) to heat by both phases, although phase I was clearly the least stable. AA

1058

Bhirud (PR), Sosulski (FW) and Sosulski (K). **Optimizing assay and extraction of lipoxygenase in wheat germ.** *Journal of Food Science* 58(5); 1993; 1090-1094

Using 3-level 7-factor response surface methodology, wheat germ lipoxygenase (LPO) assay conditions were standardized. The most important parameters were concn. of the substrate (linoleic acid) and surfactant (Tween 20), pH and temp. The standardized LPO assay conditions for the 1 ml reaction vol. were: 450µM linoleic acid, 129µM Tween 20, 175µM ethanol, 1mM EDTA, pH 6.2 (phosphate buffer), ionic strength 100mM and 40°C. LPO extraction conditions were standardized by sequential variation of parameters. Optimum conditions were a single extraction of defatted

wheat germ flour at 2-5°C with magnetic stirring of an extractant acetate buffer pH 4.5, ionic strength 100mM, at buffer-to-solid ratio 10:1. AA

1059

Monsalve (G-A) and Pomeranz (Y). **Effect of spring and winter growth habit on compositional, milling, and baking characteristics of winter wheats.** *Cereal Chemistry* 70(3); 1993; 354-359

Seven commercial winter wheat cv. were vernalized and grown under winter and spring habitat at 2 locations for 3 consecutive yr. Winter-planted wheats (WPW) were higher in test and kernel wt. and generally harder but were lower in protein and ash contents than their spring-planted (SPW) counterparts. Alkaline water retention capacity was consistently higher in SPW than in WPW. No consistent differences were recorded in soluble and total pentosans. Hardness and protein concn. were not significantly correlated. Differences in hardness, protein, ash, soluble and total pentosans, and alkaline water retention capacity of flours paralleled those in whole grains. Milling properties such as flour yield and milling score depended on test and kernel wt. Total flour yields (with higher reduction flour yields) and milling scores were consistently higher in the WPW than in their SPW counterparts. Protein dispersibility in urea was correlated with dough development time, water absorption and loaf vol. Cookie diam., generally, was higher in WPW than in SPW. AA

1060

Egidio (MGd), Nardi (S) and Vallega (V). **Grain, flour, and dough characteristics of selected strains of diploid wheat, *Triticum monococcum* L.** *Cereal Chemistry* 70(3); 1993; 298-303

Grain, flour and dough quality of 12 germ plasm accessions of domesticated diploid wheat, *Triticum monococcum* L. ("einkorn") was investigated and compared with that of modern cv. of *T. durum* and common wheat. Entries were assayed for kernel wt., test wt., yellow berry incidence, flour yield, whole meal ash and protein content, flour particle size, SDS sedimentation vol., and alveograph parameters, as well as for protein, gluten, ash and carotene content of flours. Flour yields of einkorn wheats were analogous to those of common wheat cv. and far greater than those of durum wheats. Gluten from *T. monococcum* was weak, scarcely extensible and rather sticky; it had a lower water-retention capacity than that of common and durum wheats. Reduced grain dimensions, high ash content, small flour particle size, and extremely high carotene content were distinctive features of the diploid wheats examined. The remarkably wide range of values observed for most of these attributes indicated that *T. monococcum* ted for producing the commonest wheat-based aliments could probably be identified in more extensive surveys or be obtained by breeding. Developing free-threshing commercial cv. of diploid wheat offers opportunities in foodstuff diversification, coeliac disease prevention, animal feed, production of protein-rich foods and in the exploitation of novel endosperm mutants. AA

1061

Souza (E), Tyler (JM), Kephart (KD) and Kruk (M). **Genetic improvement in milling and baking quality of hard red spring wheat cultivars.** *Cereal Chemistry* 70(3); 1993; 280-285

Forty five hard red spring wheats developed from 1911 to 1990 and commercially produced in the US Pacific Northwest region were evaluated for milling and baking quality using grain harvested from 3 Idaho locations in 1989 and 2 locations in 1990. Regression analysis, using yr of release as the independent variable, indicated significant improvement in mixing tolerance (0.046 degrees yr^{-1}), mixing time (0.019 min yr^{-1}) and corrected loaf vol. (0.079 ml yr^{-1}). Flour protein content declined significantly (-0.018 g kg^{-1} yr^{-1}) but there was no significant change in flour yield. Relative improvement of cv. baking quality over time was greater for flour from an irrigated environment than that from dry land environments. Rank summary of 8 important quality traits indicated that 9 of the 10 best quality wheat cv. were released since 1970. When grown under contemporary cultured practices, recently released cv. are generally superior to older cv. in overall baking quality

and are comparable to older cv. in milling performance. CSA

1062

Andrews (JL), Blundell (MJ) and Skerritt (JH). **A simple antibody-based test for dough strength. III. Further simplification and collaborative evaluation for wheat quality screening.** *Cereal Chemistry* 70(3); 1993; 241-246

An antibody-based [enzyme-immunoassay] method for discrimination of wheat flours or whole meal on the basis of differences in dough strength as measured by extensigraph max. resistance for example, was simplified for use in large-scale screening to predict dough quality. The major modification was the addition of unlabelled antibody to the diluted grain extract being analysed, which simplified sample handling. It reduced the dilution of the grain extracts being tested and improved the differentiation between flours of different strengths. A method was also developed for simultaneous extraction and testing of sets of 96 unweighed whole meal samples. The method was tested in a collaborative trial in 8 lab. using 2 separate analyses of a set of 16 flours, including 3 blind duplicates. Each lab. reported highly significant correlations between colour developed in the assay and rheological measurements of dough strength, such as farinograph development time and extensigraph max. resistance. Good estimates of within- and between-lab. precision were also obtained, indicating that the method was suitable for quality assessment in wheat breeding. CSA

1063

Javanainen (P) and Linko (YY). **Utilization of sprout-damaged wheat as raw material for sour dough pre-ferments with mixed cultures of lactic and propionic acid bacteria.** *Food Biotechnology* 7(2); 1993; 99-113

Utilization of sprout-damaged wheat flour (WF) in pre-ferments for sourdough breadmaking increased lactic acid (LA) formation and titratable acidity several fold in comparison to the use of bakers' WF, and resulted in a lactic acid LA to acetic acid (AA) molar ratio acceptable for sourdough bread. Enzyme treatment of sprout-damaged wheat flour with malted grain flour appeared to be necessary for a properly balanced acid formation, although α-amylase activity of sprout-damaged WF was quite high. Accumulation of LA in the pre-ferment decreased in the presence of yeast; thus the molar ratio of LA to AA could be adjusted to values suitable for sourdough breadmaking even with homofermentative LA bacteria. When using mixed culture pre-ferments of *Lactobacillus brevis* and *Propionibacterium jensenii*, at least 0.1% propionic acid (based on flour wt.), sufficient to prevent mould growth in the final bread, was obtained. BV

1064

Cuperus (G), Noyes (RT), Fargo (WS), Kenkel (P), Criswell (JT), Anderson (K). **Reducing pesticide use in wheat post-harvest systems.** *Cereal Foods World* 38(4); 1993; 199-200, 202-203

This article defines the practical integrated pest management (IPM) systems for post-harvest management, examines the factors that control biological and economic risks in wheat storage and processing systems and describes the successful implementation of IPM systems. CSA

1065

Cunfer (BM). **Management of pests on wheat and other cereal crops with an IPM program.** *Food Reviews International* 10(2); 1994; 159-175

Review. 78 references. SRA

Wheat flour

1066

Cleemput (G), Roels (SP), Oort (M-van), Grobet (PJ) and Delcour (JA). **Heterogeneity in the structure of water-soluble arabinoxylans in European wheat flours of variable bread-making quality.** *Cereal Chemistry* 70(3); 1993; 324-329

The contents of water-soluble, enzyme-extractable, and total nonstarch

polysaccharides (NSPs) were determined in flours from 6 European wheat cv. (Apollo, Slejpner, Sperber, Camp Remy, Minaret and Soissons) with different mixing time and baking absorption characteristics and, hence, widely varying bread making capacities. NSP contents varied between 0.42 and 0.69, 1.20 and 1.73 and 1.35 and 2.25%, respectively. Water-soluble NSPs were extracted and fractionated by ethanol precipitation into arabinoxylans and arabinogalactans. In the arabinoxylan fractions, β-glucan occurred as a minor contaminant. The L-arabinose to D-xylose ratios of such arabinoxylans varied between 0.51 and 0.61, whereas the ratios of di- to monosubstituted D-xylose residues (estimated by ^{1}H NMR) varied between 0.80 and 1.81. A major proportion of the xylan residues (63-66%) were not substituted by L-arabinose, whereas 13-21% and 16-24% of the D-xyloses were mono- or disubstituted, respectively. From ^{1}H NMR spectral data, it could be concluded that disubstituted D-xyloses were either isolated or occurred as pairs in the arabinoxylan chain. Shodex B-806 chromatography yielded, for all arabinoxylan fractions, 3 peaks with estimated mol. wt. between 8.5×10^5 and 5×10^3 Da, with only the relative proportions of the peaks, but not their mol. wt. varying with the variety. No apparent relationship was found between the mol. wt. profiles and the L-arabinose substitution pattern in arabinoxylans. Correlation coeff. between the analytical data obtained for the NSP content in the 6 European wheat flours and the baking absorption and mixing time of the corresponding flours increased when the structural variation in the arabinoxylans was taken into account, showing that increased knowledge of the arabinoxylan structure may lead to an enhanced understanding of the role of NSP in breadmaking. AA

1067

Ryu (GH), Neumann (PE) and Walker (CE). **Effects of some baking ingredients on physical and structural properties of wheat flour extrudates.** *Cereal Chemistry* 70(3); 1993; 291-297

Effects of 6 baking ingredients (sucrose, nonfat dry milk, whole egg powder, shortening powder, glyceryl monostearate [GMS], sodium bicarbonate) on expansion, bulk density, breaking strength and cell structure of wheat flour extrudates were studied. A Wenger TX52 twin-screw extruder was used to prepare extrudate samples. A one-half fractional 2^6 factorial experimental design was used to determine the effects of each baking ingredient on wheat flour processed under fixed extrusion conditions. Feed moisture content was 31%, barrel temp. before the die was 130°C, and screw speed was 400 rpm. Extrudate expansion was characterized by sectional, longitudinal and volumetric expansion indices (SEI, LEI and VEI, respectively). Cell structure was analysed by scanning electron microscope and by counting the number of cells per unit area. The SEI and LEI were significantly affected by both sucrose and GMS ($P < 0.01$). Interaction of shortening powder and GMS had significant effects on the LEI ($P < 0.01$), and a sucrose-egg interaction affected the SEI ($P < 0.05$). Bulk density was significantly affected by sucrose, shortening powder and GMS ($P < 0.05$). Sucrose and shortening powder had significant effects on breaking strength and cell structure. AA

1068

Seguchi (M). **Effect of wheat flour aging on starch-granule surface proteins.** *Cereal Chemistry* 70(3); 1993; 362-364

Prime starch was isolated from aged wheat flours by acetic acid extraction (pH 3.5). Starch-granule surface proteins were extracted from these starch samples with 1% SDS containing 1% 2-mercaptoethanol at room temp. (15-25°C) and quantified by the Lowry method. The amount of starch-granule surface proteins from aged flours was 3-4 times > the control samples. The SDS-PAGE pattern of extracted starch-granule surface proteins was different between control and aged samples. HPLC clearly showed that the higher molecular mass proteins (22-150 kDa) increased with ageing of the wheat flour. AA

Corn

1069

Dwivedi (R) and Godawat (SL). **Correlation between quality and ear/yield traits in maize (*Zea mays* L.) and their path coefficient analysis.** *Madras Agricultural Journal* 81(3); 1994; 125-127

Relationship between quality and ear traits in 58 high oil and protein strains of maize were studied. Grain yield per plant showed significant positive association with all yield and 2 quality traits (protein and oil). Path coeff. analysis revealed that 4 characters viz. total number of grains per ear, girth of ear, shelling % and 100-kernel wt. had max. positive direct and indirect contribution of grain yield. Oil and protein did not exhibit direct effect on yield but it had indirect contribution via total number of grains, girth of ear and shelling %. AA

1070

Mistry (AH), Xutian (Wu), Eckhoff (SR) and Litchfield (JB). **Wet-milling characteristics of high-temperature, high-humidity maize.** *Cereal Chemistry* 70(3); 1993; 360-361

Wet milling properties of high temp., high humidity corn were investigated and compared with normal high-temp., low-humidity corn. Two 1-kg samples of corn were processed at 21, 71 and 93°C and 18, 70, 80 and 1% RH. Final moisture contents were 13.9, 14.6, 14.6 and 14.5%, respectively, for each of these treatments. Corn dried at high temp. and high RH showed no significant differences in wet milling properties from corn dried at ambient temp. Corn dried at 93°C, 1% RH had lower starch yield than that dried at 93°C and 80% RH, indicating that combined effects of temp. and RH were more detrimental. Protein contents were not affected by drying conditions. Brabender viscosity properties of starches were similar for corn processed at 71°C, 70% RH and 93°C, 80% RH but were different for corn dried at ambient temp. Viscosity of starch from corn dried at 93°C was lower than that dried at ambient temp. High RH caused more shear thinning of starch than ambient drying. CSA

1071

Ramirez (W-B), Sweat (VE), Torres (PI) and Rooney (LW). **Development of two instrumental methods for corn masa texture evaluation.** *Cereal Chemistry* 70(3); 1993; 286-290

To evaluate corn masa texture, 2 instrumental methods were developed. The mechanical stickiness device (MSD) method used 2 rectangular bars (with movable upper bar) fastened at one end in a parallel arrangement with a 12-mm gap between them. A block of masa was formed between the bars and partially split with a special cutter, then one end of the movable bar was raised until the masa detached from it. The degree of adhesion of masa to the upper bar gave an adhesiveness index. The Instron compression-tension texture (ICTT) method compressed a masa disk between 2 flat plates to a thickness of 2 mm, then put the same sample under tension. Textural characteristics evaluated were adhesiveness, hardness and the compression-tension factor (CTF). Both methods tested masa made from nixtamal cooked for 55 min and conditioned at 3 moisture levels (56.8, 58.8 and 60.4%). Results were reproducible as evaluated by the coeff. of variation (range: 3.7-35.2%). Optimum masa had an MSD adhesiveness of 10-35%, ICTT adhesiveness between 8.7×10^4 and 1×10^5 Pa, and a CTF of 2.4-2.7. Masa moisture content increased adhesiveness and decreased hardness and CTF. MSD adhesiveness had a high correlation with ICTT hardness ($r = -0.90$). AA

1072

Eckhoff (SR), Jayasena (WV) and Spillman (CK). **Wet milling of maize grits.** *Cereal Chemistry* 70(3); 1993; 257-259

Maize grits obtained from the standard dry milling of whole corn kernels were studied as the raw material for wet milling. 1 size of corn grits (those that pass through a no. 5 and over a no. 10 screen), 2 levels of SO_2 concn. (0.1 and 0.2%), and 4 levels of steeping time (4, 6, 8 and 10 h) were used. Steep time could be reduced

to 6 h, and SO_2 concn. could be reduced to 0.1% in wet milling of corn grits without any significant reduction in starch yield or increase in protein content of starch. Starch recovery of up to 88.9% [dry basis] (db) was achieved from the grits, compared to a 87.4% (db) recovery from the control samples (48 h, 0.2% SO_2, whole kernels). Protein content of starch was as low as 0.5% for the 10 h steep. Highest and lowest values recorded for apparent viscosity of starch among treatments were 462 and 377 Brabender units, respectively. Both of these values were significantly lower than that of the apparent viscosity of starch obtained from wet milling of whole kernels, which was 490 Brabender units. AA

1073

Sokhey (AS) and Chinnaswamy (R). **Chemical and molecular properties of irradiated starch extrudates.** *Cereal Chemistry* 70(3); 1993; 260-268

Corn starch samples containing 0, 25, 50 and 70% amylose were γ-irradiated at 0 (native), 5, 10, 20 and 30 kGy. All starch samples were extrusion cooked at 140°C barrel temp., 140 rpm screw speed, and 18% moisture content (dry wt. basis) using a Brabender single-screw extruder. Starches irradiated at a 20-kGy dosage were extrusion cooked with and without hydrogen peroxide, potassium persulphate, or ceric ammonium nitrate. Quantity of free radicals produced on the starch increased with increasing irradiation dosages (0-30 kGy). Stability of free radicals was greater for high-amylose starches than for those with low amylose. Extrusion-cooked starches had traces of free radical activity. Acidity of irradiated starches increased with increasing irradiation dosages. Gel permeation chromatographic separation of treated starches gave 3 fractions. Fraction I was mostly amylopectin; fraction II amylose; and fraction III contained degraded products of amylopectin and amylose. Fraction I quantities of irradiated starches decreased with increasing irradiation dosages, whereas fraction II and III quantities correspondingly increased. Native starches with 0% amylose exhibited more than a 4-fold decrease in fraction I content, whereas 70% amylose native starches showed < 2-fold decrease due to increasing irradiation dose from 0 - 30 kGy. Extrusion cooking accelerated degradation of fraction I for 0% amylose starches more than for 70% amylose starches. Both 2.5 and 5% concn. of chemical additives caused excessive degradation of fraction I of starches irradiated at 20 kGy, consequently increasing reducing powers. Ceric ammonium nitrate caused the highest decrease in the iodine binding capacity of starches. Fraction I clearly suffered more degradation due to irradiation, extrusion, addition of chemical agents or a combination of these. CSA

1074

Ziegler (GR), Thompson (DB) and Casasnovas (J). **Dynamic measurement of starch granule swelling during gelatinization.** *Cereal Chemistry* 70(3); 1993; 247-251

Swelling of corn starch granules during gelatinization was monitored by a new method based on particle size analysis (PSA). Using a modified PSA chamber, for which temp. could be increased at a controlled rate, a series of particle size distributions was collected throughout the gelatinization process. Swelling behaviour of common corn starch, waxy maize (WM) starch, and cross-linked WM starch was shown to be consistent for a given starch, yet different among the 3 starches. Max. swelling power (max. swollen granule vol. per initial hydrated granule vol.) was 11.2, 16.4 and 10.3 for common corn, WM and cross-linked WM, respectively. 2 other dynamic methods of monitoring gelatinization, DSC and viscometry (Brabender Viscoamylograph), were employed for comparison to the dynamic swelling data. CSA

Kodo

1075

Parvathi (S) and Rankanayaki (K). **Screening of kodo millet varieties for recipes development.** *Madras Agricultural Journal* 81(3); 1994; 143-144

Kodo millet (*Paspalum scrobiculatum* L.) can be consumed in many different forms by incorporating pulses, egg, milk etc. Physical characteristics of 3 var. of kodo millet viz., APK.1, K.1 and Co.3, standardization of various recipes and their overall acceptability

were studied. APK.1 was found to be superior in all aspects. AA

Sorghum

1076

Jadhav (AS). **Growth, yield and quality of sorghum under double cropping systems with reference to fertilizer management.** *Madras Agricultural Journal* 81(3); 1994; 127-131

PULSES

1077

Hoppner (K) and Lampi (B). **Pantothenic acid and biotin retention in cooked legumes.** *Journal of Food Science* 58(5); 1993; 1084-1085, 1089

Samples of legumes (peas, lentils, beans, soybeans) were analysed raw for pantothenic acid (PA) biotin. Pooled samples were prepared in 1 of 3 cooking times: 20, 90 or 150 min. For each cooking time legumes were presoaked with a short soak (SS) or long soak (LS) treatment. Average PA retention in those cooked 20 min was 76% without pre-soaked, 33% for SS and 44% for LS. Biotin retention was 95% without pre-soak, 86% for SS and 90% for LS. In the 90 min group, PA acid retention differed between SS and LS (40 vs. 58%), but not for biotin (98 vs. 92%). There was no difference ($P > 0.05$) in retention between SS and LS in the 150 min group for either nutrient. It was concluded that biotin losses were min. compared to PA acid and methods of preparation could affect vitamin retention in legumes. BV

Carob

1078

Roukas (T). **Ethanol production from carob pods by *Saccharomyces cerevisiae*.** *Food Biotechnology* 7(2); 1993; 159-176

The production of ethanol from carob (*Ceratonia siliqua*) pods extract by *Sacch. cerevisiae* in static and shake flask fermentation was investigated. Shake flask fermentation proved to be a better system for the production of ethanol than static fermentation. Addition of nutrients into the carob pods extract did not improve ethanol production. Max. concn. of ethanol (75 g/l) was obtained with 0.3% inoculum, pH of 4.5, 30°C and initial sugar concn. 200 g/l. Under the same fermentation conditions, both sterilized and non-sterilized carob pods extract gave the same final ethanol concn. AA

OILSEEDS AND NUTS

Sesame

1079

Muthuswamy (P) and Sree Ramaulu (US). **Yield and mineral nutrition of gingelly (Sesamum indicum) genotypes in different soil series.** *Madras Agricultural Journal* 81(3); 1994; 136-138

Soybeans

Soy products

Soy proteins

1080

Brandenburg (AH), Weller (CL) and Testin (RF). **Edible films and coatings from soy protein.** *Journal of Food Science* 58(5); 1993; 1086-1089

A method was developed to prepare a protein-based edible films from commercial isolated soy protein (ISP). ISP was treated with alkali (ATISP) to alter film properties. Water vapour permeability (WVP), oxygen permeability (O_2P), tensile strength (TES), % elongation (%E) and appearance of ISP and ATISP were compared. Alkali treatment had no effect on WVP, O_2P and TES, gave higher %E and improved film appearance. Films properties were also compared at pH 6, 8, 10 and 12. In general, pH 6 gave higher WVP and O_2P and lower TES and %E; while higher pH gave lower WVP and O_2P and higher TES and %E. ATISP films could not be produced at pH 6. Film appearance generally improved with increased pH. BV

Carrots

1081

Howard (LR) and Griffin (LE). **Lignin formation and surface discoloration of minimally processed carrot sticks.** *Journal of Food Science* 58(5); 1993; 1065-1067, 1072

Changes in colour, lignin, soluble phenolics, phenylalanine ammonia-lyase and peroxidase activity in carrot sticks packaged with and without ethylene absorbents during storage at 2°C was studied. Lignin formation occurred and corresponded with development of white discoloration in storage. Phenylalanine ammonia-lyase and peroxidase activity were stimulated by slicing and both enzyme activities remained elevated during storage. Soluble phenolics increased during storage, while DM content decreased within 24 h after processing and then remained constant during storage. Ethylene absorbents prevented accumulation of ethylene, but did not affect surface discoloration or lignification. BV

1082

Sims (CA), Balaban (MO) and Matthews (RF). **Optimization of carrot juice color and cloud stability.** *Journal of Food Science* 58(5); 1993; 1129-1131

Investigations were conducted on the effects of heating, acidification and enzyme treatment on carrot juice colour and cloud stability. Heating whole carrots to 93°C prior to milling and pressing improved juice colour, but reduced juice yield compared to heating milled carrots to 93°C. Juice colour was improved by acidification of milled carrots to pH 4 or 5 with citric acid prior to pressing. Juice from carrots heated before milling clarified quickly if not acidified before pressing. Acidification after juice extraction did not stabilize cloud. A commercial pectinase/hemicellulase preparation improved juice colour, but not juice yield. Only 20% of potential beta-carotene was extracted from carrots during pressing and β-carotene was extracted to a greater extent than α-carotene. AA

Cassava

1083

Padmanabhan (S), Ramakrishna (M), Lonsane (BK) and Krishnaiah (MM). **Enzymic treatment of cassava flour slurry for enhanced recovery of starch.** *Food Biotechnology* 7(1); 1993; 1-10

Use of enzyme treatment for enhancing the recovery of starch from cassava flour slurry was assessed. The recovery of starch from a 33.34% slurry of cassava flour was 61 and 68%, at 24 h, under static and agitated conditions using a conventional technique in the absence of enzyme. The extent of starch release was dependent on the type and concn. of enzymes as well as the conditions of the enzymic reaction. The starch present in the cassava flour was recovered completely when 0.1% pectinase I and 0.1% cellulase were used for 24 h at 30 plus/minus 1°C under agitated conditions; 98% of starch was recovered after 36 h in static conditions. The use of 0.2% enzyme reduced the time needed for complete recovery of starch to 12 h in agitated conditions. Results suggest that inclusion of the enzymic reaction in the conventional process is beneficial. BV

Potatoes

1084

Melton (SL), Trigiano (MK), Penfield (MP) and Yang (R). **Potato chips fried in canola and/or cottonseed oil maintain high quality.** *Journal of Food Science* 58(5); 1993; 1079-1083

Flavour and overall acceptability of potato chips fried in partially hydrogenated oils (canola oil (CA), cottonseed oil (CS) and Ca:CS) were investigated. Potato chips were fried in partially hydrogenated CA, CS and CA:CS blends (85:15 and 70:30) and stored (light or dark) for 4 wk. Peroxide value was not affected by oil type or storage conditions but increased with storage time. Flavour volatiles (26) were identified and quantified. Oil type affected concn. of chip volatile aldehydes (aldehydes were lower for chips fried in 70:30 CA:CS blends than for those fried in 85:15 CA:CS or

100% CA) but not heterocyclic compounds. No differences among oil types were found in fresh chip flavour or likability scores by a sensory panel. BV

1085

Sapers (GM) and Miller (RL). **Control of enzymatic browning in pre-peeled potatoes by surface digestion.** *Journal of Food Science* 58(5); 1993; 1076-1078

Feasibility of lye digestion to remove surface tissues from peeled potatoes prior to treatment with browning inhibitors to extend shelf life was investigated. Russet and round-white potatoes were digested in 14-20% NaOH at 35-55°C for 1-13 min. After removal of digested tissue, tubers were treated with ascorbic acid-based browning inhibitor. Browning was measured by tristimulus colorimetry. Digestion extended shelf-life of high pressure steam- and abrasion-peeled potatoes to 13-15 days at 4°C, compared to 3-11 days for undigested controls. Digestion resulted in wt. losses of 12-26%, depending on treatment conditions. Lye digestion in conjunction with conventional browning inhibitors represents a viable alternative to sulphiting pre-peeled potatoes. AA

1086

Sievert (D) and Wuersch (P). **Thermal behavior of potato amylose and enzyme-resistant starch from maize.** *Cereal Chemistry* 70(3); 1993; 333-338

Thermal properties of potato amylose (degree of polymerization 5500) and of enzyme-resistant starch (RS) (degree of polymerization 65) from autoclaved maize starch in a conc. aqueous system (22%, w/w) were studied by DSC. Heating of amylose and RS in the DSC instrument to 180°C (heating rate 5°C/min) gave melting transitions at 153.6 and 139.8°C, respectively, indicating disorder of fairly thermostable regions. Heating to high temp. was accompanied by partial thermal degradation of the linear amylose and RS chains. Reappearance of endotherms during repeated heating and appearance of exotherms during each cooling phase suggested (re)association of chains from polymer melts of both amylose and RS. Association of amylose and RS chains appeared to start between 80-75°C and 60-55°C, respectively. Whereas interactions between the long amylose chains were reduced at cooling rates of > 10°C/min, interchain contacts between the shorter RS chains seemed not to be affected by cooling rate. In the presence of the complexing agent L-α-lysophophatidylcholine (LPC), the process of association of linear chains was competitively affected by the formation of inclusion complexes of the linear chains with LPC. At an LPC concn. of 10% (w/w), complex formation dominated, and no association of amylose or RS chains was observed. AA

1087

Biekman (ESA), Kroese (H-HI) and van Dijk (C). **Study of the enzymatic maceration kinetics of potatoes in a rotating perforated drum reactor.** *Food Biotechnology* 7(2); 1993; 127-141

A reactor system was developed to investigate enzymatic maceration kinetics of potatoes. The reactor consisted of a rotating perforated drum contained in a cubical box. During the maceration process the tissue liquefied, thereby increasing the dry wt. of the fluid. From the time-dependent increase of measured dry wt., the maceration rate constant k ($m.s^{-1}$) was determined. The effects of particle size, blanching time, enzyme concn., shear force and potato var. on the rate constant k were investigated. The rate constant increased with particle size and enzyme concn. The rate constant for unblanched potatoes was lower than for potatoes blanched for 5.0, 7.5, 10.0 and 12.5 min, but higher than for potatoes blanched for 2.5 min. Potato var. differing in textural properties showed different behaviour in maceration experiments. The measured rate constant for the var. studied ranged from 3.0×10^{-7} to 4.2×10^{-7} $m.s^{-1}$. The high enzyme costs, 13% of the raw material costs calculated on on the basis of the experimental results, showed that these costs will be prohibitive for large scale application of this technique. AA

1088

Maga (JA). **Potato flavour.** *Food Reviews International* 10(1); 1994; 1-48

The desirable and nondesirable volatile and nonvolatile flavour compounds identified in raw and processed potato products are discussed relative to their occurrence, formation and control. Covers raw potato volatiles, volatiles off-flavours in raw stored potatoes, glycoalkaloids and potato flavour (PF) nonvolatiles and PF, boiled PF, baked PF, potato chip flavour, french fried PF, dehydrated potato product flavour, extruded potato product flavour, potato sprout volatiles and potato processing waste volatiles. 207 references. SRA

Vegetables

1089

Kulkarni (CY) and Reddy (TKR). **Facultative pathogens from vegetable salads prepared in mass cooking establishments and detection of household pests as their reservoirs.** *Indian Journal of Microbiology* 34(2); 1994; 143-146

1726 isolates of bacteria belonging to 11 genera and 15 sp., were obtained on salads from each of local 3 hostels, hospitals, hotels and community kitchens. Hotel salads appeared to be microbiologically safe, whereas hostels, hospitals and community kitchen salads harboured 9 different types of facultative pathogens. *Proteus morganii* isolated from hospitals and community kitchen salads was also isolated from 4 pest droppings and cooks' hands. Similarly *Klebsiella pneumoniae* and *Enterobacter cloacae* I isolated from salads of community kitchens and hostels respectively were isolated from cockroach droppings. These results indicate the possibility of household pests serving as sources of contamination of facultative pathogens into salads. AA

1090

Zehnder (G). **Integrated pest management in vegetables.** *Food Reviews International* 10(2); 1994; 119-134

Review. 43 references. SRA

Broccoli

1091

Barth (MM), Kerbel (EL), Broussard (S) and Schmidt (SJ). **Modified atmosphere packaging protects market quality in broccoli spears under ambient temperature storage.** *Journal of Food Science* 58(5); 1993; 1070-1072

Broccoli spears (BS) were packaged using a semipermeable polymeric film and stored for 96 h at 20°C. CO_2 and O_2 concn. within the packages equilibrated to approx. 9 and 3%, respectively. Relative to non-packaged BS, ascorbic acid, chlorophyll and moisture retention were greater and peroxidase activity was lower in modified atm. packaged BS. No differences were found in total aerobic microbial growth or Instron shear values between packaged and control BS. BV

Gleditsia

1092

Gohar Khan and Farooqi (MIH). **Viscosity behaviour of vegetable *Gleditsia* seed gum.** *Research and Industry, India* 39(2); 1994; 120-124

Recently vegetable gum is used in various combinations and concn. Physico-chemical characterisitcs of *Gleditsia* gum in combination with microbial xanthan and carrageenan were determined. SEM studies showed a remarkable difference in structure of gum which may help to check adulteration and various application of gum. AA

Tomatoes

1093

Subbiah (K) and Raniperumal. **Studies on the effect of N, K and $CaCl_2$ on fruit cracking, skin thickness and density of tomato.** *Madras Agricultural Journal* 81(3); 1994; 138-140

Effect of N (0, 40, 80, 120 and 160 kg/ha), K (0, 50, and 100 kg K_2O/ha and $CaCl_2$ sprays (0.0% and 0.5%) on fruit cracking, skin thickness and density of fruits of tomatoes (var Co.1 and Co.3) grown during kharif season in vertisol indicated that 0.5% $CaCl_2$ sprays significantly decreased the fruit cracking. The

interaction due to the levels of N, K and $CaCl_2$ sprays had marked effect on skin thickness. The interactions of N x K and N x Var. had significant influence on density of fruits. AA

1094

Subbiah (K) and Rani Perumal. **Pectin and ascorbic acid contents in tomatoes as influenced by the graded doses of N, K and $CaCl_2$ sprays.** *Madras Agricultural Journal* 81(4); 1994; 227-229

Pectin and ascorbic contents of fresh, ripe tomato fruits of cv. CO.1 and Co.3 collected between 2nd and 4th pickings were analysed. Application of N significantly influenced the pectin content of tomato fruits and the highest pectin content was observed at 160 kg N/ha. Pectin content varied with the cv. and Co.1 registered the highest pectin content. Combined application of 100 kg K_2O/ha and 0.5% $CaCl_2$ sprays increased the pectin content. Application of 120 kg N/ha registered the highest ascorbic acid content while N exceeding the level reduced it. Application of K had no effect on ascorbic acid. Application of $CaCl_2$ increased the ascorbic acid content. Combined application of 120 kg N/ha plus 50 kg K_2O/ha proved superior in improving the ascrobic acid content. GS

FRUITS

1095

Gamero (M), Fiszman (SM) and Duran (L). **Stress relaxation of fruit gels. Evaluation of models and effects of composition.** *Journal of Food Science* 58(5); 1993; 1125-1128, 1134

Stress relaxation behaviour of kappa-carrageenan (1%) gels (C) and kappa-carrageenan (0.5%) plus locust bean gum (0.5%) gels (G) was studied. Effects of addition of sugar (18.3, 36.6 and 55°Brix) and fruit pulp (15%) on relaxation response were analysed. Curves were fitted to Maxwell (M), Peleg (P) and simplified Maxwell (SM) equations. All 3 equations were valid to quantify relaxation behaviour of fruit gels and to evaluate the effects of changes in composition, with P and SM equations being simpler. Locust bean gum increased initial stress decay rate and decreased proportion of unrelaxed force. Sucrose produced the opposite effect. Fruit pulp effects were weak and dependent on gelling system. AA

1096

Anon. **Rich's versatile freeze flo fruit range.** *Confectionery Production* 59(1); 1993; 41

The 'freeze flo' fruits manufactured for caterers, bakers and food manufacturers are made from natural fruits. They remain soft but firm in texture, are ice free and come in a wide range of flavours. They can be used to enhance the appearance, taste and overall quality of many dessert foods. Consideration is given to their versatility, suitability for new innovative products and use in health related food products. CSA

1097

Brunner (JF). **Integrated pest management in tree fruit crops.** *Food Reviews International* 10(2); 1994; 135-157

Review. 128 references. SRA

Apples

1098

Monsalve Gonzalez (A), Barbosa Canovas (GV) and Cavalieri (RP). **Mass transfer and textural changes during processing of apples by combined methods.** *Journal of Food Science* 58(5); 1993; 1118-1124

Mass transfer (MT) and textural changes of 'Red Delicious' apple slices and cylinders during osmotic adjustment of a_w by the combined method approach (low pH, low a_w and antimicrobial agents) were studied at 30, 40 and 50°C. MT of water and sugar in treated apples followed typical log-normal behaviour with most changes occurring during early stages of the process. The changes followed Crank's equation for diffusion. A negative correlation between apple texture and sugar diffusion was observed. Softening occurred at early stages of osmotic treatment. The texture changes were most pronounced at the edges of the apple tissue where the sugar had

penetrated. Softening and sugar uptake were more pronounced when apples were acidified (citric acid, ascorbic acid and 4-hexylresorcinol). Apples became firm within 2 h of processing when the external layer of apple cylinders penetrated by sugar was trimmed. Calcium chloride > 0.30% minimized tissue softening, but the typical crispy structure of the fresh apple was not restored. BV

1099

Kim (DM), Smith (NL) and Lee (CY). **Quality of minimally processed apple slices from selected cultivars.** *Journal of Food Science* 58(5); 1993; 1115-1117, 1175

Slices of 12 apple cv. were stored for 12 days at 2°C. Changes in respiration and quality factors (firmness, colour, soluble solids, titratable acidity and wt. loss) were compared. Initial respiration rates among cv. varied from 3.5 ml CO_2/kg/h in Delicious to 7.6 ml CO_2/kg/h in Monroe and decreased rapidly during the first 3 days. Idared, McIntosh, Delicious and Rome showed relatively low respiration throughout storage. Firmness of slices during storage decreased gradually for 7 days and more rapidly thereafter. Empire, Golden Delicious and Idared apples showed min. changes in firmness. Change in colour of slices was rapid during the first 3 days. Cortland, Empire, Golden Delicious, New York 674 and Delicious showed least browning. Titratable acidity, pH, soluble solids, and wt. changes during storage were small and varied by cv. NY 674, Cortland, Golden Delicious, Empire and Delicious showed more desirable attributes for min. processing. SRA

1100

Kim (DM), Smith (NL) and Lee (CY). **Apple cultivar variations in response to heat treatment and minimal processing.** *Journal of Food Science* 58(5); 1993; 1111-1114, 1124

Eleven apple cv. were subjected to heat treatments (HT) at various times and temp. Susceptibility to browning during and after HT was evaluated. Changes in firmness, respiration rate, soluble solids and acidity of slices prepared with heat treated apples were measured. Incidence of browning was dependent upon cv. and heating temp.; Liberty, Monroe, RI Greening and Rome were very susceptible, while McIntosh, NY 674 and Empire were less susceptible. Golden Delicious and Delicious showed relatively strong tolerance to heat. Apples that received HT at 45°C produced slices with less browning and firmer texture compared to non-treated apples. The positive effect of HT might help produce high quality min. processed fruits. AA

Grapefruits

1101

Baker (RA). **Firmness of canned grapefruit sections improved with calcium lactate.** *Journal of Food Science* 58(5); 1993; 1107-1110

Hand cut commercially produced grapefruit sections (GFS), packed in either juice or syrup, were treated with 0.1-0.5% calcium lactate (CL) throughout the 1988-1989 season and monitored for changes in shear force resistance. Firmness of both juice and syrup control packs declined about 40% during the processing season. Ca addition did not reverse seasonal softening but incrementally decreased loss of firmness during processing. Improvements in texture were independent of seasonal changes, and remained relatively constant throughout the season. Optimal levels of CL were 0.3-0.4% for juice packed GFS and the highest level used was 0.5%, for syrup packed GFS. Max. increases in firming due to Ca in juice and syrup packed GFS were 38 and 50%, respectively. AA

Grapes

1102

Terrell (FR), Morris (JR), Johnson (MG), Gbur (EE) and Makus (DJ). **Yeast inhibition in grape juice containing sulfur dioxide, sorbic acid, and dimethyldicarbonate.** *Journal of Food Science* 58(5); 1993; 1132-1134

Effectiveness of preservatives (SO_2), sorbic acid (SA), dimethyldicarbonate (DMDC) and their combinations) for inhibition of yeast spoilage in grape juice was studied. Grape juice was inoculated with yeast at 2, 200 and 20 000

cfu/ml; SO_2, SA, dimethyldicarbonate DMDC and combinations of these were evaluated for suppression of fermentation at 21 and 31°C. No significant differences were noted in fermentation times for SO_2, SB or SO_2 + SB treatments. 0.8mM DMDC was most effective in suppressing fermentation for all inoculation levels and temp.; 0.8mM SO_2 + DMDC and SB + DMDC were effective at 31°C. As preservative and inoculum concn. increased, time to fermentation increased and decreased, respectively. Storage at 31°C decreased effectiveness of SO_2, SB and SO_2 + SB, but increased effectiveness of DMDC and SO_2 + DMDC, and SB + DMDM at 0.8mM level. BV

Kinnow mandarin orange

1103

Panda (PC) and Ahlawat (SS). **Keeping quality of pasteurized kinnow egg liquid.** *Poultry Guide* 31(6); 1994; 27-29

Kinnow juice was mixed with fresh eggs and 0.1% potassium sorbate, pasteurized at 57°C for 15 min and stored at 4 plus or minus 1°C. Product was acceptable upto 4 days, though the bacterial spoilage was noticed only after 6 days. Pasteurization and adjustment of egg liquid pH to 4.5 was improved the shelf-life and acceptability of the Kinnow egg liquid. GS

CONFECTIONERY, STARCH AND SUGAR

1104

Siswoputranto (S). **Indonesia: a dynamic source of cocoa.** *Manufacturing Confectioner* 73(2); 1993; 61-64

Growth of cocoa production in Indonesia since the 17th century is briefly outlined with particular mention of Java and Sumatra. Exports of cocoa products from Indonesia in 1991 include (kg): cocoa beans 127 064 264; cocoa butter, fat and oil 10 509 329; cocoa paste 319 000; and chocolate blocks, slabs and bars (un-filled) 4 185 000. The 3 main importing countries for Indonesian cocoa products in 1991 were the USA, Germany and Singapore. CSA

Confectionery

1105

Gonze (M) and Schueren (F). **Sorbitol powder - a powerful performer in sugar-free tabletting.** *Confectionery Production* 59(5); 1993; 410-411, 420

The role of sorbitol powder in sugar-free tabletting and the ways in which sorbitol's performance can be modified are considered. They include: sorbitol morphology; flow; friability; flavour influence; flavour powder additions; and flavour liquid additions. CSA

1106

Anon. **Sollich systems for confectionery decoration.** *Confectionery Production* 59(3); 1993; 210-211, 214

Various sollich automatic confectionery decorating systems for chocolate products such as roll, disc and spiral decorators; eccentric decorator; fork mark decorator; decormatic SDC; decograph (high performance computerized, self-programable decorating system); decorating by sprinkling; cocoa powder sprinkling; and spiked truffles are described in this article. CSA

1107

Richmond (W). **Choice confections - hand rolled creams: manufacturing methods and formulas.** *Manufacturing Confectioner* 73(6); 1993; 81-92

Methods of manufacture of different hand-rolled sugar confectionery creams are outlined in this article. A typical basic product contains sugar, invert sugar, cream of tartar, frappe and water; the mixture is cooked to 244-246°C, poured onto a wet slab, cooled to about 100°C and creamed until cloudy, after which flavour, invertase and acid solution are added. The cream is then hand-rolled (or extruded through a hand-roll machine) until firm enough to dip in a suitable coating. A var. of flavours can be used. CSA

1108

Moore (C). **Direct steam cooking.** *Manufacturing Confectioner* 73(6); 1993; 73-76

The technical features of direct steam cooking which include: cooking equipment (continuous pressure cooking systems - steam injection cookers, swept surface heat exchangers, static coil cookers); direct steam injection cookers; and cooking operation (the slurry, steam supply, cooking system, steam separation) are discussed in this article. A flow diagram for a jet cooking system is also included. CSA

1109

Klacik (K). **Syrup cooking technology.** *Manufacturing Confectioner* 73(6); 1993; 59-62, 64, 66, 68-72

Aspects reviewed in this article are the ingredients (sugar, corn syrup, sugar-free ingredients, water, quality of ingredients); basic syrup preparation (solubility of raw materials, dissolution, boiling point basics); and cooking systems (types of hard candy cookers, extraction devices, fondant cooking, microbiological considerations). Also discusses the basic procedures that must be followed to determine whether the syrup is to be used for panning, hard candy, fondant or marshmallow; ingredients that must be blended in the correct ratio and must be totally dissolved to prevent uncontrolled crystallization; concn. that is to be carried out to give a specific solids content or degree of supersaturation; and the correct cooking system that must be chosen to prevent premature crystallization. 8 references. CSA

1110

Anon. **U.S. confectionery consumption 1992.** *Manufacturing Confectioner* 73(9); 1993; 107-114

A summary of the USA Department of Commerce report on sugar confectionery consumption in 1992 is presented. Significant increases in consumption, mainly in the non-chocolate sector, and a 2.5-fold increase in exports of non-chocolate products is reported. The increase in exports of chocolate and chocolate products in 1992 balanced the decrease experienced in 1991. Tables showing domestic consumption, imports and exports (quantity and value) of chocolate and non-chocolate confectionery products, and comparisons made with previous years are also included. CSA

1111

Anon. **European food dealer market.** *Manufacturing Confectioner* 73(9); 1993; 81-82

1112

Keunecke (K). **German sweet goods market.** *Manufacturing Confectioner* 73(9); 1993; 101-106

Effects of the adverse economic climate and of specific economic conditions in Germany since reunification are discussed in relation to the German sugar confectionery, chocolate, biscuit and ice cream sectors in 1992. Overall production of sweet goods decreased by 0.4% (chocolate products decreased by 4.2% and biscuits by 3.0%). Detailed production statistics (vol. and value) for individual products in the various sectors, are presented in pie charts and histograms. CSA

1113

Poehlmann (H). **International chocolate, sugar confectionery and biscuit industry 1991.** *Manufacturing Confectioner* 73(9); 1993; 85-90

Trends in consumption of chocolate, sugar confectionery and biscuits for the yr 1991 are tabulated individually in the article for the 13 IOCCC contributing countries (mainly European, plus Australia and Japan). Consumption overall has increased since 1980 (the 1st year of reporting), and particularly in 1989-1991. CSA

1114

Mitsch (B). **Flavor trends in the worldwide confectionery industry.** *Manufacturing Confectioner* 73(8); 1993; 29-32

Application of new technologies (application of fractionation techniques to citrus flavours; encapsulation; and reaction flavours (flavours developed during processing, complete flavour

systems incorporating mouthfeel and taste as well as aroma) to the development of food flavourings is considered in the article together with flavour trends (globalization; reduced fat/sugar products; functional candy; market fragmentation; confectionery for children (fads, 'shock candy' e.g. which produces foam around the mouth); trends in other food areas (beverages, fruit snacks); popular flavours (sour, watermelon), and trends in confectionery around the world (Mexican-style flavours, healthy image products, chewing gum, sugar-free products, value-added products e.g. semi-pharmaceutical products)) in the sugar confectionery market. CSA

1115

Anon. **Directory of ingredients, equipment and packaging.** *Manufacturing Confectioner* 73(7); 1993; 27, 29-31

1116

Anon. . **Spanish confectionery market.** *Manufacturing Confectioner* 73(5); 1993; 25-26

1117

Anon. **UK chocolate/confectionery market.** *Manufacturing Confectioner* 73(4); 1993; 43-45

1118

Payne (G). **The Australian market place - a time of change?.** *Manufacturing Confectioner* 73(2); 1993; 45-51

1119

Anon. **US confectionery imports, September 1992 and year-to-date.** *Manufacturing Confectioner* 73(1); 1993; 32, 34, 36-40

1120

Gottlieb (A). **Why NAFTA is important.** *Manufacturing Confectioner* 73(1); 1993; 48-53

Chocolates

1121

Jeffery (MS). **Key functional properties of sucrose in chocolate and sugar confectionery.** *Food Technology* 47(1); 1993; 141-144

Aspects dealt in this article are the different types of confectionery-fat-phase and syrup-phase confectionery, the functional properties in fat-phase confections (sweetness, stability, bulk, particle size distribution, mouthfeel and acceptability, product rheology, crystalline-amorphous structure transformation, caramel flavour development in milk chocolate), functional properties in syrup-phase confections (sweetness, solubility in water, supersaturation, crystallization from super saturated sol., formation of gel structures, reactions with milk protein to give caramel flavours, breakdown with heat, acid and invertase) and the nutritional value of both fat-and syrup-based confections. CSA

1122

Sweger (LB). **Rapid *Salmonella* methodology in the chocolate industry.** *Manufacturing Confectioner* 73(6); 1993; 77-80

A review of the incidence of food poisoning and the methods for detection of *Salmonella* in chocolate products, is presented under the headings: reasons for rapid analysis; history (of analytical methods); comparison of systems; and other methodology. Rapid methods currently in use for detection of Salmonella spp. include: ELISA methods (complete systems such as Salmonella-Tek and Assurance EIA Rapid Method, the latter using a polyclonal system designed to reduce false positives); methods based on DNA hybridization (e.g. Gene-Trak); the Bio-Control 1-2 Test, a screening method for motile salmonellae in foods; the Hydrophobic Grid Membrane Filter (ISO-Grid); and conductance technology (e.g. Malthus M1000 system). 10 references. CSA

1123

Gutshall (Z-A) and Dimick (PS). **Influence of various refining treatments on the crystallization behavior of hard and soft cocoa butters and formulated dark chocolate.** *Manufacturing Confectioner* 73(9); 1993; 117-123

Commercial prime-pressed cocoa butters from the Ivory Coast and Brazil, and 2 Bahian butters, were classified as hard or soft as a result of crystallization curves and analyses for triacylglycerol and fatty acid methyl esters. The hard and soft cocoa butters, together with formulated dark chocolate (approx. 42% cocoa liquor, 46% sucrose, 12% cocoa butter and 0.15% lecithin), were then subjected to 4 variations of the standard refining treatment: (i) degumming (D), caustic neutralization (CN), water washing (W), bleaching (B) and deodorization (DO); (ii) D, CN, W and B; (iii) CN, W and B; and (iv) CN, W and drying. Results showed that all refining treatments reduced the induction period of crystallization, extent of the reduction varying with both treatment and cocoa butter source. In the soft Bahian cocoa butter, refining reduced induction time from 4 h to 60 min (treatment (iii)) and also increased crystallization rate. Effects of treatments on hardness, bloom stability and flavour of dark chocolate varied with the type of cocoa butter used in the formulation; in most cases bloom stability was improved compared with that of samples made with unrefined cocoa butter. CSA

1124

van der Waerden (T). **Netherlands cocoa and chocolate industry 1992.** *Manufacturing Confectioner* 73(9); 1993; 93-98

Starch

1125

Ray (L) and Majumdar (SK). **Enzymatic hydrolysis of starch to glucose, and immobilization of amyloglucosidase in calcium alginate gel.** *Research and Industry, India* 39(2); 1994; 109-112

Aspergillus oryzae amylases (α-amylase and amyloglucosidase) were used for both liquefaction and saccharification of starch from different sources. Optimum conditions for liquefaction of starch (25 ml starch-enzyme mixture in 50 ml Erlenmeyer flask), were pH 5.1, temp. 40°C, incubation period 2 h with shaking at 90 r.p.m. and for saccharification, pH 4.8, temp. 50°C, incubation time 22 h. Max. conversion of potato, tapioca, shati and soluble starch to glucose were 82, 82, 70 and 96.9% respectively. Then amyloglucosidase from *Asp. oryzae* was partially purified and immobilized in calcium alginate gel matrix that retained 77% of the activity of free enzyme. Optimum pH of the enzyme was shifted from 4.8 to 5.1 by immobilization optimum temp. remaining the same. Km values for free and immobilized enzyme were 0.4 and 0.1% respectively. Immobilized enzyme can be stored at 4°C for 28 days without any significant loss of activities. AA

1126

Lai (HM), Schmidt (SJ), Chiou (RG), Slowinski (LA) and Day (GA). **Mobility of water in a starch-based fat replacer by ^{17}O NMR spectroscopy.** *Journal of Food Science* 58(5); 1993; 1103-1106

The water mobility (WM) of starch-based fat replacers (SFR) (stellar, modified corn starch produced by controlled hydrolysis) affected by concn., type and level of ingredients (sugars, corn syrup solid, NaCl, proteins, gums and emulsifiers), heat and freeze/thaw treatments was studied using ^{17}O NMR spectroscopy. WM in the SFR samples containing gums, proteins or emulsifiers was similar to that of samples without additional ingredients. WM was not affected by heat treatment, but was increased by freeze/thaw treatments. WM in the solute containing samples was lower than in samples without additional ingredients and changed only slightly after heat and freeze/thaw treatments. BV

1127

Myeong (H-M) and Giddings (JC). **Rapid separation and measurement of particle size distribution of starch granules by sedimentation/steric field-flow fractionation.** *Journal of Food Science* 58(5); 1993; 1166-1171

Sedimentation/steric field-flow fractionation (Sd/StFFF) is introduced as a new technique for the size analysis of starch granules. Sd/StFFF provides both high speed and high resolution, and narrow size fractions of starch granules can be collected from the eluting stream for further characterization by microscopy or other techniques. The sedimentation FFF instrument (similar

structure to the Model S101 Colloid/Particle Fractionator) was calibrated and applications were made to 12 starch samples derived from wheat, durum wheat, corn, oat, tapioca and potato. The instrument response curve (the fractogram) and size distribution curves for several of these samples were recorded. The mode or bimodal diam. and the % of A- and B-granules were compiled. AA

Sugar

1128

Awad (A) and Chen (AC). **A new generation of sucrose products made by co-crystallization.** *Food Technology* 47(1); 1993; 146-148

This article describes the process of co-crystallization, the unique functional properties of co-crystallized sugar products (improved homogeneity, improved dispersibility, control of sweetness release, improved solubility, improved emulsification) and the 3 categories of co-crystallized sugar products (food ingredients, intermediate products and instant products). CSA

1129

Baker (CW). **Production of sucrose-based carbohydrates for the food industry.** *Food Technology* 47(1); 1993; 149-150

Production of sucrose thermal oligosaccharides with desirable nutritional and functional characteristics from mixtures of non-crystalline sucrose and citric acid by low-temp. thermolysis and high-temp. thermolysis is described in this article. CSA

BAKERY PRODUCTS

1130

Anon. **New developments in fat mimetic technology for bakery products.** *Confectionery Production* 59(5); 1993; 418-419

N-Lite range comprising of 4 functionally different fat mimetics, which have been specially developed for 3 product groups of European food industry viz., dairy products, bakery products and liquid systems are discussed. They represent an effective and economical method of responding to the demand for high quality low-fat, low-cholesterol and low-calorie products. The use of N-Lite B, a waxy maize-based maltodextrin, to replace over 50% of bakery fats in a range of bakery products, are also dealt. CSA

Bread

1131

Roels (SP), Cleemput (G), Vandewalle (X), Nys (M) and Delcour (JA). **Bread volume potential of variable-quality flours with constant protein level as determined by factors governing mixing time and baking absorption levels.** *Cereal Chemistry* 70(3); 1993; 318-323

Six European wheat flours with varying breadmaking potentials (Apollo, Slejpner, Sperber, Camp Remy, Minaret and Soissons; Glu-1 scores 4, 4, 7, 6, 9 and 10, respectively) and pentosan levels were brought to constant protein level with starch. Breads were baked in a straight-dough procedure with varying mixing times (MT) and baking absorption levels (BA). Response surface methodology showed that, among all realistic combinations of interdependent variables of MT and BA, there is no optimum combination resulting in a superior bread loaf. Bread vol. increased with longer MT and higher BA levels, handling properties of the resulting doughs being the limiting factor. When flours of different cv., adjusted to a constant protein level, were baked with the same MT and BA, they yielded breads of essentially equal vol. Baking performance thus determined by applying the MT and BA levels showed that the differences in breadmaking potential of such flours must be attributed to a great extent to factors governing the mixing and absorption level characteristics of the flour. Analysis of pentosan contents indicated that higher water-soluble pentosan levels resulted in lower BA levels and mixing tolerance (and thus lower bread vol.), and that an inverse relationship existed between the handling properties of a dough and the flour water-soluble pentosan content. The Glu-1

score was in good agreement with the vol. potentials and MT of the different flours. CSA

Pan bread

1132

Siffring (K) and Bruinsma (BL). **Effects of proof temperature on the quality of pan bread.** *Cereal Chemistry* 70(3); 1993; 351-353

A variety pan bread formula was used in examining the effects of proof temp. with relatively constant proof duration. Proof temp. varied from 24 to 52°C, and enough yeast was added to keep proof times constant. Internal temp. of dough were monitored before and during baking and effects on finished loaf vol. and internal grain and texture were examined. A sponge-and-dough baking process was used for a 1-lb finished wt. product. Loaf vol. was greater at lower proof temp. Differences of up to 700 cm^3 in loaf vol. were found between lowest (75°F) and highest (125° F) proof temp. Dough from lower proof temp. had greater oven spring and better appearance. Crumb grain and texture were improved at lower temp. Lower proof temp. required increased yeast levels, but gave stronger dough properties and higher quality product. CSA

Pasta

1133

Farber (JM), Warburton (DW), Laffey (P), Purvis (U) and Gour (L). **Modified-atmosphere packaged pasta: a microbiological quality assessment.** *Italian Journal of Food Science* 5(2); 1993; 157-166

A national survey was conducted to determine the overall microbiological quality of fresh and frozen modified atmosphere packaged (MAP) pasta. All samples were analysed for aerobic colony counts (ACC), coliforms, *Escherichia coli*, *Staphylococcus aureus* and *Salmonella*. There was wide variation in ACC values, but 23.8 and 40% of the plain and filled finished products, respectively, contained > 10^6 cfu/g. Similar values were also observed for the total psychrotroph counts. Detectable levels of *S. aureus* were found in 17.5 and 33.7% of the plain and filled products, respectively; figures for *E. coli* were 4.3 and 24.2%. *Salmonella* spp. were not detected. Although no standards or guidelines for MAP fresh pasta are available, the impact of proposed 3-class plans for ACC, psychrotrophs, *S. aureus*, coliforms and *E. coli* was assessed in terms of % lot failures. AA

Spaghetti

1134

Malcolmson (LJ) and Matsuo (RR). **Effects of cooking water composition on stickiness and cooking loss of spaghetti.** *Cereal Chemistry* 70(3); 1993; 272-275

Effects of cooking water composition on stickiness and cooking loss of spaghetti made from durum and common wheat were examined using 7 cooking waters varying in mineral content. Water hardness was calculated as 1.7-512 p.p.m. of $CaCO_3$. All cooking waters had a pH of approx. 7.7 except deionized water. Regardless of the cooking water used, spaghetti made from common wheat was stickier than that made from durum wheat, and both were stickier when cooked in tap, well, or formulated waters (F3 and F4). The 2 spaghetti types showed similar cooking losses, except when cooked in well water. Spaghetti made from durum wheat did not appear to be as affected by hardness of the well water as spaghetti made from common wheat. Results confirm the need to use a standardized cooking water when comparing results from 1 test session to another or from 1 lab. to another. CSA

Tortillas

1135

Friend (CP), Waniska (RD) and Rooney (LW). **Effects of hydrocolloids on processing and qualities of wheat tortillas.** *Cereal Chemistry* 70(3); 1993; 252-256

Effects of hydrocolloids were evaluated in hot-press wheat tortillas. Natural gums (arabic, guar and xanthan), modified cellulose gums (MCG) (carboxymethylcellulose [CMC], hydroxypropylmethylcellulose and methylcellulose), and commercial blends (mixtures of natural and MCG) were utilized. Farinograph values, mixing characteristics, dough machinability, tortilla characteristics

(diam., wt., moisture content and appearance), rollability over time, and freeze-thaw stability were determined. Increased levels of gums resulted in doughs that were more sticky and less cohesive throughout mixing. Doughs prepared with commercial blends containing cellulose gum exhibited characteristics similar to those using CMC, such as lower initial dough viscosity and longer dough development times compared with those of the control. Hot-press wheat tortillas containing natural gums, MCG, or commercial blends were consistently round, puffed, slightly browned, and of good quality. Tortilla diam. (159 mm), wt. (41.4 g), and moisture content (30.8%) were similar for all tortillas. Water absorption of dough increased when more gums were added. Rollability of tortillas was retained longer with CMC and cellulose-based commercial blends. Rollability of all tortillas decreased during freezing and thawing, and tortillas containing CMC were significantly more rollable than control tortillas after 5 freeze-thaw cycles. Proper gluten development appeared to be essential for good dough machinability, tortilla qualities and tortilla shelf stability. AA

MILK AND DAIRY PRODUCTS

1136

Prathap Reddy (K). **Measuring performance of dairy co-operatives.** *Indian Dairyman* 45(10); 1993; 446-453

Performance of dairy co-operatives is based on how far they have benefitted their owner-producer farmers, their profitability, new products development and development of their employees. Models of organisational effectiveness are compared against the criteria of overall performance, productivity, employee satisfaction, profit or rate of return and withdrawal. Internal and external factors facilitating the performance of dairy cooperative unions are listed. GS

1137

Rizvi (SSH), Zer (R-YU), Bhaskar (A) and Rosenberry (L). **Phase equilibria and distribution coefficients of** δ-lactones in supercritical carbon dioxide. *Journal of Food Science* 58(5); 1993; 996-1000

1138

Siva (CV), Sannabhadti (SS) and Shah (RK). **Control of bacterial endospores in dairy industry.** *Indian Journal of Dairy Science* 46(12); 1993; 547-554

This article reviews the significance of spore forming bacteria in milk and milk products and various methods of their control. Aspects covered are food poisoning outbreaks, defects in milk and milk products, control, at the farm, hygienic milk production and handling at the farm, bactofugation, creaming of milk, heat treatment, treatment of air, hydrogen peroxide treatment, use of lysozyme, nitrate, nisin and selected lactic starter, micellaneous treatments, cold pre-ripening of cheese and dairy plant hygiene. 146 references. SRA

Milk

1139

Ray Chaudhuri (AK). **Milk marketing.** *Indian Dairyman* 45(11); 1993; 491-493

One of the important factors on which the business of dairying depends on is what price is being received by the milk producers and what price is paid by the consumers. Producer's price depends on milk composition and also type whether it is cow or buffalo. Retail price similarly depends on the composition, type of milk, type of packaging and system of distribution. Retail price should not be beyond the consumers' purchasing power. On the other hand, the producers' price should be such that the farmers get a remunerative price. AA

1140

Bradley (RL). **Cholesterol removal from milk fat.** *Indian Dairyman* 46(5); 1994; 255-257

Advantages and demerits of 3 techniques for cholesterol removal from milk fat viz., stream-stripping process similar to vegetable oil refining, super-critical extraction method using carbon dioxide to selectively dissolve cholesterol, and adsorption technology where β-cyclodextrins, saponins, activated charcoal and other too expensive to be commercially

viable are reviewed. Stream stripping technology is much in vogue. GS

1141

Dongjin (DLU) and Nielsen (SS). **Heat inactivation of native plasminogen activators in bovine milk.** *Journal of Food Science* 58(5); 1993; 1010-1012, 1016

Inactivation of plasminogen activators (PA) appeared to follow 1st order kinetics in the temp. range tested (60, 70, 80, 120, 130 and 140°C). The Arrhenius plot of Ft (ratio of PA activity at end of heating time to original PA activity) vs. heating time was linear (correlation coeff. 0.990). The Arrhenius equation for heat inactivation was deduced, from which the rate of inactivation at any temp. in the range 60-140°C could be calculated. Decimal reduction time (D-value) was 109 min at 70°C and 32 s at 140°C. This indicated that native PA in bovine milk were not affected by pasteurization, and to a large extent were not inactivated by UHT dairy processing conditions. SRA

1142

Ustunol (Z), Hicks (CL), Payne (FA) and Milton (K). **Effect of pH, temperature and enzyme concentration on diffuse reflectance profiles of coagulating milk.** *Italian Journal of Food Science* 5(2); 1993; 107-114

A randomized block design replicated 3x was used to determine effects of pH (6.3, 6.5 and 6.7), temp. (29.4, 32.2 and 35°C) and enzyme concn. (single strength calf rennet 0.177, 0.206 and 0.247 ml/900 g) on diffuse reflectance profiles of coagulating milk. Diffuse reflectance profiles were monitored for 30 min using a fibre optic sensor operating at 950 nm. Diffuse reflectance was observed to increase sigmoidally as coagulation time increased. Time to max. slope of the diffuse reflectance profile max. value of the first derivative at this time, and floc and cut points were determined. Slope of the diffuse reflectance curve increased as enzyme concn. and temp. increased and pH decreased. Time to floc and cut point decreased as enzyme concn. and temp. increased and pH decreased. Monitoring diffuse reflectance of coagulating milk in cheese vats may be a realistic method to determine an objective cutting point. AA

1143

Moio (L), Dekimpe (J), Etievant (PX) and Addeo (F). **The neutral volatile compounds of water buffalo milk.** *Italian Journal of Food Science* 5(1); 1993; 43-56

Volatile compounds isolated from water buffalo (*Bubalus arnee*) milk using vacuum distillation and subsequent liquid-liquid extraction were analysed. Analysis of the neutral volatile components using high resolution GC (HRGC) and HRGC/MS led to the identification of 75 constituents and evaluation of 51. The neutral volatile extract is mainly characterized by esters (50%), particularly ethyl esters of butanoic and hexanoic acid, aldehydes (14%), nitrogen compounds (13%), ketones (9%), aliphatic alcohols (5%), aromatic hydrocarbons (2.5%) and sulphur compounds (4%). Aroma of the individual components was assessed using HRGC equipped with sniffing port. The possible origins of these compounds and their relationship to the characteristic flavour of this milk are discussed. BV

1144

Solaroli (G), Pagliarini (E) and Peri (C). **Composition and nutritional quality of mare's milk.** *Italian Journal of Food Science* 5(1); 1993; 3-10

Information available on the production and composition of mares' milk is reviewed. Aspects covered include: production; sensory and physical characteristics; chemical composition; lipidic fraction; nitrogen fraction; and minor components. It is concluded that mares' milk has interesting nutritional properties, and is especially suitable for the elderly, convalescent consumers and infants. 45 references. BV

1145

Khedkar (CD), Garge (RD), Mantri (J-M) and Khedkar (GD). **Effect of feeding acidophilus milk on serum cholesterol in human subject of 40-50 years.** *Indian Journal of Dairy Science* 46(12); 1993; 577-580

Acidophilus milk (AM) was fed to 20 randomly selected human subjects between 40-50 yrs at 200 g/day for a period of 30 days. Blood serum cholesterol level (SCL) were analyzed before feeding the AM, during feeding and after stoping feeding. It was observed that the AM can significantly reduce the SCL during feeding. Though the SCL gets increased after 15 days of stopping feeding, it was observed to be significantly lower than the initial SCL. This study indicates that the *Lactobacillus acidophilus*-LBKV3 grown in milk is either able to uptake the cholesterol from gastrointestinal tract or inhibit cholesterol synthesis and reduce the SCL in blood. SRA

Milk products

1146

Baxi (JJ). **Export of milk and milk products.** *Indian Dairyman* 46(5); 1994; 229-235

The growth and prospects of the Indian dairy industry in comparison with the world milk production; production and export marketing of major dairy products like skimmed milk powder, whole milk powder, butter and cheese; GATT provisions and its impact on international trade; strategies to improve the quality and productivity of the dairy products and to reduce the cost of production; and the attempts of organised efforts in dairy development in India through co-operatives are reviewed. GS

Butter

1147

Safari (M), Kermasha (S) and Pabai (F). **Interesterification of butter fat by lipase from *Mucor miehei* in organic solvent media.** *Food Biotechnology* 7(3); 1993; 265-273

Butter fat was interesterified in 3 organic solvents, hexane, hexane-chloroform (70:30, v/v) and hexane-ethyl acetate (70:30, v/v), at 0, 0.2, 0.4, 0.6, 0.8, 1.0 or 1.2% water content, using commercial immobilized lipase from *M. miehei*. Results suggest that addition of 30% chloroform or ethyl acetate to hexane resulted in a 25% increase in interesterification yield; addition of 0.8-1.0% water shifted the hydrolytic affinity of lipase towards low mol. wt. fatty acids. However, addition of a small amount of water (0.4%) to hexane, increased amount of free fatty acids from 0.30 to 7.98 mmol/g butter. BV

Cheese

Cheddar cheese

1148

Tewari (BD) and Singh (S). **Performance of bacterial milk clotting enzyme from *Bacillus subtilis* k-26 in Cheddar cheese making.** *Indian Journal of Dairy Science* 46(12); 1993; 573-576

Milk clotting enzyme from a bacterial source *B. subtulis* K-26 was compared for its performance in cheese making with 5 commercial milk clotting enzymes from fungal sources, viz., *Mucor miehei* and *M. pusillus* var. Lindt. Acid development was almost similar in all cases but the total manufacturing time was slightly more in case of cheese making with the bacterial rennet. Yields were also similar. During ripening, changes in maturity index and total volatile fatty acids were slightly more in bacterial rennet cheese. However, changes in pH was slower. No marked differences in organoleptic quality of cheese was noticed after 3 months of ripening of cheese. AA

Comte cheese

1149

Roudot (A-F), Bars Dle, Einhorn (J), Adda (J) and Gripon (JC). **Flavor constituents of aqueous fraction extracted from Comte cheese by liquid carbon dioxide.** *Journal of Food Science* 58(5); 1993; 1005-1009

Isolation, purification and identification of some low-mol. wt. compounds from a water-soluble extract of Comte cheese were achieved. Liquid CO_2 extraction, subsequent fractionation by gel permeation and reverse-phase HPLC and MS were employed. Major constituents were N-acyl amino acids (N-acetyl methionine, N-propionyl methionine, N-propionyl leucine, N-propionyl phenylalanine), diketopiperazines (cyclo(Pro-Pro), cyclo(Pro-Val), cyclo(Pro-Phe),

cyclo(Pro-Leu), cyclo(Pro-Ala)) and non-peptide compounds (theobromine, 4-methyl-t-thiazoleethanol, uracil, (5-6)dihydro-uracil, thymine). These compounds were synthesized and tasted. Most were bitter. N-propionyl methione had a cheese flavour but was not detected when added to a simulated cheese at 180 mg/l. SRA

Mozzarella cheese

1150

Yin (L-H), Yun (JJ) and Anandha Rao (M). **Rheological properties of Mozzarella cheese filled with dairy, egg, soy proteins, and gelatin.** *Journal of Food Science* 58(5); 1993; 1001-1004

The rheological behaviour of Mozzarella cheese (MC) mixed with various proteins (whey protein (WP), caseinate, egg white (EW), soy protein isolate (SPI), gelatin) was determined by uniaxial compression at 10°C and the effect of temp. (10-60°C) was determined by dynamic measurement. MC with WP, caseinate, EW and SPI showed significant water retention during heating. SPI induced the strongest gel network structure with MC. All proteins altered the viscoelastic properties of MC. Addition of proteins decreased the influence of temp. on complex viscosity. SRA

1151

Moio (L), Dekimpe (J), Etievant (PX) and Addeo (F). **Volatile flavour compounds of water buffalo Mozzarella cheese.** *Italian Journal of Food Science* 5(1); 1993; 57-68

The neutral volatile compounds in water buffalo Mozzarella cheese were isolated by distillation under vacuum and collected in traps cooled with liquid nitrogen. The distillate was extracted with dichloromethane and the extract obtained was analysed using high resolution GC (HRGC) and HRGC/MS. 85 compounds were identified and 65 quantitatively determined. The olfactory properties of many of these compounds were determined by sniffing the GC effluent. Ketones made up about half of the volatile components in the extract, acetoin being the most represented. A new compound also belonging to the ketones and with an aroma of smoked cheese was also detected. Alcohols (20%), aldehydes (10%), esters (1%), lactones (2.3%), sulphurous compounds (0.1%), aromatic hydrocarbons (3.4%) and nitrogen compounds (11%) were the other compounds present in this cheese. Most of the aldehydes and ketones identified, together with 1-octen-3-ol, linalool, geraniol, indole, 4-methylphenol and furfural are the volatile compounds which seem to influence the smell of this cheese to the greatest extent. AA

Taleggio cheese

1152

Piergiovanni (L), Fava (P) and Moro (M). **Shelf-life extension of Taleggio cheese by modified atmosphere packaging.** *Italian Journal of Food Science* 5(2); 1993; 115-127

Taleggio cheese was packed using 4 gas atm. (100% N_2, 10% CO_2 and 90% N_2; 20% CO_2 and 80% N_2; and 30% CO_2 and 70% N_2) and results were compared to those using paper wrapping. Packaged samples were stored for 3 wk at 6 plus/minus 2°C. Sensory analysis was then carried out, together with microbial and chemical analyses and analysis of rind colour. Results showed that all cheeses were of satisfactory quality after the storage period. Best results were, however, obtained with 10% CO_2 and 90% N_2 atm. Modified atm. packaging is therefore a suitable alternative to traditional paper wrapping for packaging Taleggio cheese. A simple model for predicting CO_2 evolution in the pack was developed and tested. Results showed that it was suitable for indicating appropriate packaging materials and packs of suitable dimensions. BV

Ice cream

1153

Moorthy (PRS) and Balachandran (R). **Low fat ice cream - a newer concept in frozen desserts.** *Indian Dairyman* 45(10); 1993; 454-455

Advantages of low-fat ice cream like low cost; expansion of the industry with the surplus fat; and cholesterol reduction; methods to reduce fat content of ice cream from a normal level of 10 to 12% without sacrificing its texture, taste,

flavour and legal standards are presented. Low fat ice cream is cheap and also useful as low cholesterol diet. GS

Milk powders

1154

Awasthi (RC). **Milk powder market.** *Indian Dairyman* 46(5); 1994; 249-250

Highly perishable nature of milk causes problems in purchase and sale. In order to face the competitive world export market, Indian milk industry should adopt proper planning, consumer survey, quality control, advertising and promotional activities. GS

1155

Munjial (M). **Bulk density of milk powders - factors influencing it.** *Indian Dairyman* 46(5); 1994; 259-263

Criteria for designing a dryer for milk powder such as final powder composition; consumer preferences; shipping requirements; type of dryer (viz. co-current, counter current or mixed flow design). Optimum operating conditions (viz., the max. inlet air temp. and min. outlet air temp.); residual moisture content; bulk density, particle size distribution, colour, storage life, and flowability are detailed. GS

Milk proteins

1156

McSweeney (PLH), Olson (NF), Fox (PF), Healy (A) and Hojrup (P). **Proteolytic specificity of plasmin on bovine α_{s1}-casein.** *Food Biotechnology* 7(2); 1993; 143-158

Proteolytic specificity of plasmin (fibrinolysin, EC 3.4.21.7, from bovine plasma) on bovine α_{s1}-casein was determined in solution in 50mM ammonium bicarbonate buffer, pH 8.4, at 37°C. Peptides, isolated by reverse-phase HPLC on a C18 column or by electroblotting from urea-polyacrylamide gel electrophoretograms, were identified from their amino acid sequence and mass. The principal plasmin cleavage sites were found at Arg_{22}-Phe_{23}, Arg_{90}-Tyr_{91}, Lys_{102}-Lys_{103}, Lys_{103}-Tyr_{104}, Lys_{105}-Val_{106}, Lys_{124}-Glu_{125} and Arg_{151}-Gln_{152}. The initial cleavage sites and the order of production of small (pH 4.6-soluble) peptides suggest that α_{s1}-casein was cleaved initially towards the centre of the molecule. AA

Wheys

1157

Hung (TY) and Smith (DM). **Dynamic rheological properties and microstructure of partially insolubilized whey protein concentrate gels.** *Journal of Food Science* 58(5); 1993; 1047-1049, 1054

Viscoelasticity and microstructure of gels prepared with 4 whey protein concentrates (WPC) with solubilities from 27.5 to 98.1% in 0.1M NaCl, pH 7.0 were evaluated. Dynamic moduli were determined while 16% (w/w protein) WPC in 0.6M NaCl, pH 7.0, was heated isothermally at 90°C for 15 min. Storage moduli (G') increased and tangent δ decreased when 80.0 and 98.1% soluble WPC were heated, whereas G' and tangent δ of 27.5 and 41.0% soluble WPC did not change. 27.5% soluble WPC had the highest G' throughout the heating period. Rheological measurements suggested that globular aggregates observed in 80.0 and 98.1% soluble WPC were formed during heating, whereas aggregates in 27.5 and 41.0% WPC were present prior to heating. AA

1158

McClements (DJ), Monahan (FJ) and Kinsella (JE). **Disulfide bond formation affects stability of whey protein isolate emulsions.** *Journal of Food Science* 58(5); 1993; 1036-1039

The viscosity and degree of flocculation of 20 wt.% n-hexadecane oil-in-water emulsions stabilized by whey protein isolate (1 wt.% WPI in 0.05M phosphate buffer, pH 7.0) increased as the emulsions aged. These effects were reduced but not completely eliminated when N-ethylmaleimide (0.5-20mM), a sulphydryl blocking agent, was added to the emulsions immediately after homogenization. SDS-PAGE showed an increase in the extent of intermolecular disulphide bond formation between proteins absorbed at the droplet interface with time. Flocs were probably formed initially by non-covalent bonding or bridging

flocculation and then stabilized by disulphide bonds between proteins absorbed to different droplets. AA

1159

Mucchetti (G), Taglietti (P), Gatti (M) and Neviani (E). **Whey ultrafiltration: evaluation of protein retention with different membranes.** *Italian Journal of Food Science* 5(2); 1993; 99-106

Protein retention ability of 7 ultrafiltration (UF) membranes having different chemical composition, configuration and mol. wt. cut off (MWCO) was tested using defatted clarified Grana cheese whey. Exponential flux decay behaviour was typical for the tests. The best average flux of permeate was obtained with a spiral wound regenerated cellulose membrane (MWCO = 30 kDa) and with a plate acrylonitrile membrane (MWCO = 20 kDa). Protein retention was good for both membranes up to a vol. concn. factor of about 4 (R > 0.97). At a vol. concn. factor > 4 the protein content of permeates increased. Ion-exchange chromatography showed the presence of alpha-lactalbumin in all the permeates, whereas beta-lactoglobulin was only detected in the permeates obtained by UF with polyvinylendifluoride membranes (MWCO = 40 kDa) and hollow fibre polysulphone membranes (MWCO = 50 kDa). Membranes having 100 kDa MWCO are not suitable for the production of whey protein concentrates, but they may be the first step of a fractionated separation of proteins with larger MWCO, such as lactoferrin from whey. AA

Yoghurts

1160

Laye (I), Karleskind (D) and Morr (CV). **Chemical, microbiological and sensory properties of plain nonfat yoghurt.** *Journal of Food Science* 58(5); 1993; 991-995, 1000

Chemical and microbiological properties of 4 plain nonfat yoghurts (3 commercial and 1 control) were determined after 2, 6 and 12 days refrigerated storage. Sensory properties were determined after 6 days storage. Viable culture bacteria concn. ranged from 140 to 8000 x 10^6 g and ratios of *Lactobacillus* to *Streptococcus* ranged from 0.18 to 15.4. pH, titratable acidity, lactic, pyruvic, uric, acetic and propionic acids and lactose were determined by HPLC and 23 major volatile organic compounds were determined by dynamic headspace analysis. Lactic acid concn. ranged from 7.5 to 9.9 mg/g while pyruvic, uric, acetic and propionic acids ranged from 5.5-23.1, 32.5-68.1, 112-204 and 50-193 µg/g, respectively. pH ranged from 4.17-4.58 and titratable acidity from 0.92-1.40 for all 4 yoghurts, throughout 12 days refrigerated storage. Major flavour volatiles in all yoghurts included: acetaldehyde; heptane; acetone; diacetyl; and benzothiazole. Sensory panels indicated a preference for control No signifcant differences were noted in texture, flavour or overall acceptability of the 3 commercial yoghurts. AA

MEAT AND POULTRY

Meat

1161

Mermelstein (NH). **Controlling *E. coli* 0157:H7 in meat.** *Food Technology* 47(4); 1993; 90-91

Fatal food poisioning outbreak caused by the consumption of undercooked *E. coli* 0157:H7 contaminated hamburgers which led the USDA to propose improved inspection procedures is discussed in this article. CSA

1162

Skog (K). **Cooking procedures and food mutagens: A literature review.** *Food and Chemical Toxicology* 31(9); 1993; 655-675

This review covers cooking procedures, influence of cooking time and temp. on mutagenic activity, identity of mutagens (pyrido-imidazoles or indoles, quinolines, quinoxalines, pyridines and furopyridines) occurrence in cooked foods, formation of mutagens, chemical factors affecting the yield (amino acids and dipeptides, sugars, inhibitory effect of sugars and other carbohydrates, other inhibitors and fats) animal studies, risk evaluation and general discussion. 159 references. BV

Beef

1163

Boyle (EAE), Sofos (JN) and Schmidt (GR). **Depression of a_w by soluble and insoluble solids in alginate restructured beef heart meat.** *Journal of Food Science* 58(5); 1993; 959-962, 967

1164

Stillmunkes (AA), Prabhu (GA), Sebranek (JG) and Molins (RA). **Microbiological safety of cooked beef roasts treated with lactate, monolaurin or gluconate.** *Journal of Food Science* 58(5); 1993; 953-958

Beef roasts were pumped with sodium lactate (SL), glycerol monolaurin (GM) or sodium gluconate (SG) and inoculated with *Clostridium sporogenes* and *Listeria monocytogenes* either internally or on external (surface) locations. Microbiological evaluations were conducted during simulated wholesale (2°C), retail (7°C) and consumer storage (10°C) and after simulated mishandling (25°C). SL resulted in effective inhibition of pathogens at concn. less than or equal to 3.5%. GM was less effective than SL. SG did not provide significant control of *Cl. sporogenes* and *L. monocytogenes*. No chemical or quality effects of these compounds occurred on the beef roasts except a lower pH and increased purge caused by monolaurin. BV

1165

King (JW), Johnson (JH), Orton (WL), McKeith (FK), O'Connor (PL), Novakofski (J), Carr (TR). **Fat and cholesterol content of beef patties as affected by supercritical CO_2 extraction.** *Journal of Food Science* 58(5); 1993; 950-952, 958

1166

Duizer (LM), Gullett (EA) and Findlay (CJ). **Time-intensity methodology for beef tenderness perception.** *Journal of Food Science* 58(5); 1993; 943-947

The Time-Intensity (TI) technique for measuring tenderness of bovine psoas major, longissimus dorsi, semitendinosus and shank was assessed. Results were compared to conventional line scale measurement of tenderness. From the TI curve, the duration and area parameters (Increase and Decrease Area and Area Under the Curve) were most useful for sample separation. Using various TI curve parameters, panellists were classified according to their perception of tenderness, with 2 clusters identified. A comparison of line scale results of force to chew and time to chew to the TI results showed that comparable tenderness measurements were obtained by the 2 tests. AA

1167

Madhavi (DL) and Carpenter (CE). **Aging and processing affect colour, metmyoglobin reductase and oxygen consumption of beef muscles.** *Journal of Food Science* 58(5); 1993; 939-942, 947

1168

Venugopal (RJ), Ingham (SC), McCurdy (AR) and Jones (GA). **Anaerobic microbiology of fresh beef packaged under modified atmosphere or vacuum.** *Journal of Food Science* 58(5); 1993; 935-938

Beef was packaged under CO_2 containing < 500 p.p.m. O_2, vacuum or air and stored at 0, 2 or 4°C. Samples were analysed weekly for bacterial numbers using anaerobic plate count (pre-reduced medium and anaerobic chamber), aerobic plate count and anaerobic jar plate count (MAP samples only) methods. For both MAP and vacuum packaged samples, the anaerobic plate count was consistently greater than the aerobic plate count and for MAP samples the anaerobic plate count was consistently higher than the anaerobic jar plate count. Differences between plating methods were most frequent during the latter third of 0 and 2°C storage. Anaerobic isolates from MAP samples were most often lactic acid cocci and staphylococci. No clostridia were isolated from any of the treatments. Results suggest that when 37°C incubation temp. is used, anaerobic plate counts are more accurate than aerobic plate counts for estimating the microbial load of fresh MAP beef. BV

1169

Lan (YH), Novakofski (J), Carr (TR) and Mckeith (FK). **Assay and storage conditions affect yield of salt soluble protein from muscle.** *Journal of Food Science* 58(5); 1993; 963-967

Pork *Longissimus dorsi* and beef *Longissimus dorsi* and semimembranosus muscles were used to evaluate assay and storage effects on yields of salt soluble protein (SSP). Assay conditions included pH (5.5, 6.0 or 6.5), extraction vol. (6, 9, 12 or 15 x sample wt.), homogenization time (30, 60, 90 or 120 sec) and centrifugal force (2500, 4000 or 5500 x gn). Storage conditions included post mortem ageing (4°C) for 0, 7 or 14 days) and freezing (rapid freezing, slow freezing and freezing-thawing-freezing). Highest yield of SSP was obtained using pH 6.0, extraction fol. 15x sample wt., centrifugation at 4000 x gn and homogenization time 90-120 sec for both pork and beef. Freezing conditions did not affect measurement of SSP. Aging beef for 7 and 14 days post mortem reduced yield of SSP; however, such differences were not observed for pork. BV

Pork

1170

O'Connor (PL), Brewer (MS), McKeith (FK), Novakofski (JE) and Carr (TR). **Sodium lactate/sodium chloride effects on sensory characteristics and shelf-life of fresh ground pork.** *Journal of Food Science* 58(5); 1993; 978-980, 986

Fresh ground pork was formulated with sodium lactate (SL) (0, 1.5 or 3%) and NaCl (0, 0.5, 1, 1.5, 2, 2.5 or 3%) to evaluate effects on sensory characteristics. Aerobic plate count (APC) over retail storage (25 days) was evaluated on samples rated in the mid-range (plus/minus 0.5 S.D of mean) of salty flavour intensity (SI) by a trained sensory panel. SL increased ($P < 0.05$) SI and juiciness and enhanced ground pork flavour. Sodium added as SL was less perceptible as 'salty' than that added as NaCl. SL significantly reduced ($P < 0.05$) APC; based on spoilage level of 10-6 cfu/g, SL extended shelf life (3% SL) by about 12 days compared to controls. AA

1171

Rourke (TJ), Clarke (AD), Bailey (ME) and Hedrick (HB). **HPLC quantitation of alginate or pectin added to lean ground pork.** *Journal of Food Science* 58(5); 1993; 973-977

An HPLC method is reported for isolating and quantifying uronic acid(s) (UA) of alginate or pectin added at various concn. to lean (5-7% crude fat) ground pork. The method uses an Aminex HPX-87H$^+$ column, isocratic 0.009N H_2SO_4 eluent and UV detection. For regression equations derived from mean UA concn. to predict % of alginate or pectin, R^2 values were 0.99 for total UAs (alginate) and 0.97 for galacturonic acid (pectin). Reproducibility was 84% for alginate and 94% for pectin contents. Recoveries were: alginate 85% and pectin 80%. SRA

1172

Bozzano (AI), Guardo (G-di), Saccares (S), Bilei (S), Zottola (T), Brozzi (AM), Panfili (G), Fontanelli (G). **Occurrence of Salmonella in pork meat and processed pork products in the Latium region (Central Italy) from 1980 to 1989.** *Italian Journal of Food Science* 5(2); 1993; 167-172

Products

Meat

1173

Eilert (SJ) and Mandigo (RW). **Procedure for soluble collagen in thermally processed meat products.** *Journal of Food Science* 58(5); 1993; 948-949

Methods to determine the extent of collagen solubilization during thermal processing in frankfurters were evaluated. A modified procedure to separate soluble collagen from thermally processed meat samples without solubilizing more collagen was developed. Frozen, powdered frankfurter was mixed with Ringers solution in test tubes. Stirred samples were incubated in water baths at temp. of 36, 40, 44, 48, 52 and 56°C for 5, 10 and 15 min. Samples were centrifuged, filtered, autoclaved and hydroxyproline levels were assayed spectrophotometrically. Collagen values were

expressed as mg collagen/g of sample, using hydroxyproline conversion values of 7.25 and 7.52 for insoluble and soluble collagen, respectively. Soluble collagen increased up to 48°C and 10 min, leveling off beyond that. In a 48-52°C water bath 10-15 min was sufficient to separate soluble collagen from thermally processed meat products without solubilizing more. BV

Ham

1174

Careri (M), Mangia (A), Barbieri (G), Bolzoni (L), Virgili (R), Parolari (G). **Sensory property relationships to chemical data of Italian-type dry-cured ham.** *Journal of Food Science* 58(5); 1993; 968-972

Poultry

Chickens

1175

Lee (S-T), Randall (VG) and Schade (JE). **Chlorine uptake by chicken frankfurters immersed in chlorinated water.** *Journal of Food Science* 58(5); 1993; 987-990

Chicken frankfurters, with and without the processing casing wrapped on the outside, were soaked in water containing 1.1-11.3mM hypochlorite (HC) for 1, 4 and 24 h. Casing retarded, but did not prevent chlorine uptake which increased with increasing HC concn. of immersion sol. and with increasing immersion time. For frankfurters with casing, uptake of chlorine by a 45 g frankfurter immersed for 1 h in 2.8 or 11.3mM HC sol. was 18 and 72 µmoles, respectively. Immersed for 24 h, uptake was 99 and 268 µmoles, respectively. Rate of chlorine uptake increased with concn. of chlorine in water but decreased rapidly with time. BV

Broilers

1176

Dhande (VU), Kukde (RJ) and Lende (RM). **Influence of feeding livol on dressed and edible meat percentage of broilers.** *Poultry Guide* 31(7); 1994; 57-59

Meat quality of broilers fed on diets supplemented with livol at 0.2% (T1) and 0.5% (T2) levels was compared with the control at the age of 8th wk. Average live body wt. were 1280.52 g., 1503.25 g and 1594.31 g, average dressing % 78.87, 79.82 and 87.81 and edible meat % 67.23, 68.52 and 74.95 in control, T1 and T2 groups respectively. Hence, there were no significant differences between its treatment. In T1 and T2 there was a 2-5% increased growth over the control group. The cost of feed required per kg edible meat in experimental broilers at 8th wk of age were Rs. 11.74, Rs. 10.51 and Rs. 11.34 in control, T1 and T2 groups respectively. AA

Turkeys

1177

Northcutt (JK), Lavelle (CL) and Foegeding (EA). **Gelation of turkey breast and thigh myofibrils: changes during isolation of myofibrils.** *Journal of Food Science* 58(5); 1993; 983-986

The relationship between functional properties of meat and myofibrils was examined for turkey breast and thigh by determining gel-forming ability of proteins at each step in a myofibril isolation procedure. Physical properties of thermally induced gels (70°C for 30 min) were determined by torsional fracture analysis. Max. shear stress (force) was obtained after removal of water-soluble components, whereas filtration was required to achieve max. shear strain (deformability). Shear stress increased 150% and shear strain 59%. Changes in fracture properties were similar between meat types, and therefore, not the cause of meat type-associated differences in comminuted turkey. AA

Products

Eggs

1178

Pandey (NK), Anand (SK) and Verma (SS). **Peelability and quality characteristics of hard cooked shell eggs stored at**

refrigeration temperature. *Indian Journal of Poultry Science* 29(1); 1994; 67-71

Peeling characteristics, microbial and sensory profile of hard cooked shell eggs stored at refrigeration temp. (5°C) were evaluated at 0, 3, 5, 7, 10, 14, 18 and 21 days. Stored eggs showed no improvement in peelability, peeled surface appearance, yield of peeled eggs and peeling time. No significant change was observed in either total aerobes or yeast and moulds of egg contents. However, staphylococcal counts recorded an increase while the coliforms appeared only after 14 days of storage. Yolk flavour and egg odour scores decreased from day 5, but were unacceptable on day 18. Albumen texture did not improve, being tough and rubbery. Yolk surface became extremely dark green on day 3, but the discoloration disappeared after day 10. AA

1179

Sreevani (M) and Krishna Kumar. **A qualitative study of shelled eggs marketed in and around Hyderabad.** *Poultry Guide* 31(6); 1994; 71-73

Egg wt., shell thickness, shape index, Haugh unit score, Albumen and yolk indices were determined for 200 shelled eggs marketed from 5 different channels in and around Hyderabad, India, during November, 1991 to February, 1992. The mean values for the above were 51.6 g, 0.04 mm, 75.43%, 96.4, 0.084 and 0.39 respectively. Incidence of dirty eggs, cracks, blood and meat spots were 10.5%, 15.2%, 10 and 30% respectively. Physical composition of shelled egg were 11.2, 59.952% and 28.96% for shell, albumen and yolk respectively. Good quality shell eggs were supplied in Hyderabad. AA

1180

Rossi (M), Spedicato (E) and Albania (V). **A normal-phase HPLC method for analysis of total cholesterol in eggs.** *Italian Journal of Food Science* 5(2); 1993; 151-155

A normal-phase HPLC method for detn. of cholesterol in egg-yolk powder was developed. The method, which uses pregnenolone as an internal standard, was investigated for linearity, reproducibility, recovery and limit of detection. BV

1181

Oetles (S) and Hisil (Y). **High pressure liquid chromatographic analysis of water soluble vitamins in eggs.** *Italian Journal of Food Science* 5(1); 1993; 69-73

An ion-paired reverse-phase HPLC method was modified for the detn. of individual water soluble vitamins (vitamins B_2, B_6, niacin and folic acid) in eggs. The modified HPLC system consisted of a μ-Bondapak C18 column, a solvent system of water-methanol (78:22 v/v)-PIC B6 (2.4×10^{-3}M), a flow rate of 0.3 μl/min and a UV detector. Recoveries of 102.3, 97.5, 98.9 and 92.5% were obtained for vitamins B_2, B_6, folic acid and niacin, respectively, in all egg samples. AA

1182

Conrad (KM), Mast (MG), MacNeil (JH) and Ball (HRJr). **Composition and gel-forming properties of vacuum-evaporated liquid egg white.** *Journal of Food Science* 58(5); 1993; 1013-1016

Liquid egg-white (LEW) was evaporated under vacuum (4.7 kPa) in a water-jacketed vessel to produce a concentrated, LEW product, 3 water-jacket temp. (40, 50 and 60 °C) and 4 processing times (0, 30, 45 and 60 min). For the 60°C, 60-min treatment, solids content increased (P less than or equal to 0.05) from 11.5 to 21.8% Concn. did not affect true gel strain (P greater than or equal to 0.05), but gel shear stress increased (P less than or equal to 0.05) with increased solids concn. SRA

1183

Conrad (KM), Mast (MG), Ball (HR), Froning (G) and MacNeil (JH). **Concentration of liquid egg white by vacuum evaporation and reverse osmosis.** *Journal of Food Science* 58(5); 1993; 1017-1020

Effects of concn. of liquid egg whites by reverse osmosis (RO) and vacuum evaporation (VE) on physical and chemical properties of egg whites were evaluated. Effects of food additives guar gum (GG) and sodium lauryl sulphate (SLS) on

the concentrates produced by RO and VE were also determined. The treatments consisted of a control, RO process, VE process using 50°C water-jacket temp. and 60-min processing time (5060VE) and a VE process using 60°C water-jacket temp. and 45-min processing time (6045VE). Solids contents for the concentrates were 17.82% for the RO, 17.41% for the 6045VE and 18.98% for 5060VE. The VE product had better foaming properties and comparable gel qualities to that of the RO product. Addition of GG or SLS improved the quality of all concentrates. Electrophoretic studies indicated a significant decrease in globulins A1 and A2 in the VE treatments. SRA

SEAFOODS

1184
Swamy (PK). **Opportunities for exporting marine products to the USA.** *Seafood Export Journal* 25(15); 1994; 21, 23, 25, 28-29, 31-32, 35, 37, 39-40

Reviews global trade in seafoods (shrimps, tunas, ground fish, small pelagics, cephalopods, salmon, fishmeal and fish oil); status of seafood market in USA; status of Indian fisheries in the world scenario; statewise marine fish landings in India; export performance of marine products from India; countrywise export of marine products from India; itemwise exports from India; measures to increase export opportunities to USA; and investment policies in fisheries. GS

1185
Jayaraman (R). **Exports of marine products does not affect domestic consumption.** *Seafood Export Journal* 25(16); 1994; 23, 27, 29

Indian export of fresh/frozen fish rose from 7.66% in 1986-87 to 20.22% in 1992-93. In 1993-94, export of ribbon fish, reef cod, red snapper, white snapper, ghol and mackerel showed 7% increment over that of 1992-93. However hardly two-third of marine fish potential available only is exploited and hence inland fish production should be boosted with aquaculture. GS

Fish

1186
Feeney (RE) and Yeh (Y). **Antifreeze proteins: properties, mechanism of action, and possible applications.** *Food Technology* 47(1); 1993; 82, 84-88, 90

The protein properties of antifreeze proteins found in polar fish, cold-tolerant insects and plants, its effect on freezing and melting temp. and the possible practical applications of antifreeze proteins in agricultural and food industries such as recrystallization inhibition, protecting non-polar fish, agricultural crops and possible usage in foods are described. CSA

1187
Thakur (BR) and Patel (TR). **Sorbates in fish and fish products - a review.** *Food Reviews International* 10(1); 1994; 93-107

This report reviews and summarizes studies that have tested sorbates alone or in combination with other compounds, techniques in extending the shelf-life of fish and fish products. Methods of application, effects on shelf-life, microbial flora, chemical changes and sensory quality of fish are the aspects included. 95 references. SRA

Shrimps

1188
Gagne (N) and Simpson (BK). **Use of proteolytic enzymes to facilitate the recovery of chitin from shrimp wastes.** *Food Biotechnology* 7(3); 1993; 253-263

Two proteolytic enzymes (chymotrypsin [EC 3.4.21.1] and papain [EC 3.4.22.2]) were used to hydrolyse proteins associated with demineralized shrimp waste (SW) to recover chitin. Conditions used were optimized using response surface methodology. Factors studied were temp. (25-40°C for chymotrypsin, 25-47°C for papain), pH (6.5-9.1 for chymotrypsin, 6.8-8.8 for papain) and enzyme to waste ratio (E/W ratio) (2:1000-10:1000 for chymotrypsin, 2:1000-18:1000 for papain). Of these, pH was the most important factor in the models obtained. Optimum conditions for

deproteination by chymotrypsin were determined to be approx. 40°C, pH 8.0 and E/W ratio 7:1000 (w:w). For papain, a temp. of approx. 38°C, pH 8.7 and E/W ratio 10:1000 (w:w) gave the optimum response. Under these conditions, the protein yield was max., 22-48% depending on the starting material. Residual protein levels in the SW after enzymic deproteination were very low, i.e., 1.3 and 2.8% for chymotrypsin and papain-treated samples respectively. BV

Cod

1189

Chan (JK), Gill (TA) and Paulson (AT). **Thermal aggregation of myosin subfragments from cod and herring.** *Journal of Food Science* 58(5); 1993; 1057-1061, 1069

Turbidity of fish myosin subfragment solutions increased with temp., except cod (*Gadus morhua*) heavy meromyosin turbidity, which leveled at temp. > 45°C. Extent of aggregation and number of cross-linking sites for cod heavy and light meromyosins were significantly higher than for herring (*Clupea harengus*) ($P < 0.05$), but only at temp. > 35 and 45°C, respectively. Thermal aggregation ability increased linearly with increased surface hydrophobicity (So) for the myosin subfragments, except for cod heavy meromyosin where the increase in So between 45-55°C did not correspond to an increase in cross-linking ability. The lessened aggregation ability of herring myosins may be due to the low cross-linking of the heavy meromyosin (S-2) region. SRA

Mackerels

1190

Kumazawa (Y), Seguro (K), Takamura (M) and Motoki (M). **Formation of ε-(γ-glutamyl) lysine cross-link in cured horse mackerel meat induced by drying.** *Journal of Food Science* 58(5); 1993; 1062-1064, 1083

The cross-linking reaction of myosin heavy chain and formation of epsilon-(gamma-glutamyl)lysine bonds in salt cured meat from horse mackerel during drying were investigated. Transglutaminase involvement in manufacture of Himono (dried fish) and Kamaboko (fish cake) was also studied. Block meat cut from horse mackerel was cured in 3M NaCl (pH 7.5) in the presence and absence of 5mM EDTA (to remove Ca ions from solution) for 3 h at 4°C. During drying at 30°C, changes in the myosin heavy chain and ε-(γ-glutamyl)lysine isopeptide bonds in the meat were observed. After 20 h drying, cross-linking of myosin heavy chain was observed and ε-(γ-glutamyl)lysine bonds increased 8 fold. These changes were inhibited in the presence of EDTA (suggesting that Ca ions were essential for cross-linking of heavy myosin chain). Results suggest that transglutaminase may be involved in the cross-linking reaction of the myosin heavy chain in the manufacture of *Himono* in Japan. BV

Whiting

1191

Hsu (CK), Kolbe (E), Morrissey (MT) and Chung (YC). **Protein denaturation of frozen Pacific whiting (*Merluccius productus*) fillets.** *Journal of Food Science* 58(5); 1993; 1055-1056, 1075

Protein denaturation in Pacific whiting (*M. productus*) fillets stored at -8, -20, -34 and -50°C was investigated over a 10-month period by salt-soluble protein extractability (SSPE), Ca^{2++}-ATPase activity and the torsion test. Quality of fillets stored at -8°C were significantly greater than those of fillets stored at lower temp. Fillets stored at -34 and -50°C showed no significant change over those stored at -20°C as measured by SSPE and Ca^{2++}-ATPase activity. However, fillets stored at the lower temp. had slightly higher torsion shear strain. SRA

1192

Morrissey (MT), Wu (JW), Lin (D) and An (H). **Protease inhibitor effects on torsion measurements and autolysis of Pacific whiting surimi.** *Journal of Food Science* 58(5); 1993; 1050-1054

Beef plasma protein (BPP), egg white (EW) and potato extract (PE) (1, 2, 3 and 4%) were tested for their ability to inhibit proteolysis in fish

mince and surimi made from Pacific whiting (*Merluccius productus*). Strong inhibition resulted from all 3 compounds in fish mince when measured by autolysis. However, when tested in surimi significant differences occurred among the compounds. BPP showed strongest inhibition of proteolytic effect (1% BPP increased shear strain by 70%, with further increases at higher concn.) followed by EW and PE when measured by autolysis, gel electrophoresis and torsion. Results suggest that BPP was an effective proteinase inhibitor in surimi at a concn. as low as 1%, preventing degradation of high mol. wt. proteins important for gelation. BV

PROTEIN FOODS

Nil

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

Alcoholic beverages

Wines

1193

Kinsella (JE), Frankel (E), German (B) and Kanner (J). **Possible mechanisms for the protective role of antioxidants in wine and plant foods.** *Food Technology* 47(4); 1993; 85-89

Physiological mechanisms by which flavonoids, phenolics and other phytochemicals in wine and plant foods prevent or ameliorate some common chronic diseases are discussed in this article. CSA

1194

Mazzoleni (V) and Colagrande (O). **Composition of bottle-fermented Italian sparkling wines.** *Italian Journal of Food Science* 5(2); 1993; 129-137

212 samples of bottle-fermented Italian sparkling wines were analysed for volatile compounds, ethanol, sugars, pH, acidity, SO2, sugar-free extract, ash, tartaric acid, malic acid, lactic acid, total nitrogen, glycerol, minerals and internal pressure. There was little variability in ethanol, pH, acidity, sugar-free extract and internal pressure, showing that present-day technologies are able to control the major traits of these wines. Contents of some volatile compounds were highly variable, indicating that they might contribute to the character of examined sparkling wines. BV

1195

Mannino (S) and Martignoni (E). **Sugar determination in musts and wines with a flow system and amperometric detection at constant potential with a chemically modified electrode.** *Italian Journal of Food Science* 5(1); 1993; 37-41

A flow injection system is described for the detn. of sugars in wines. The system is based on amperometric detection at a Nafion-copper modified electrode operating at constant potential (+0.5 V). To eliminate possible interferences, a clean-up step was performed by using a sorbent extraction procedure with CH and SAX Bond Elut cartridges. The system was capable of detecting total sugars in musts and wines at a throughput of 15 samples/h. Comparison with the European Official method showed a correlation coeff. of 0.99. AA

1196

Ravaglia (S) and Delfini (C). **Production of medium chain fatty acids and their ethyl esters by yeast strains isolated from musts and wines.** *Italian Journal of Food Science* 5(1); 1993; 21-36

The ability of 48 yeast strains to produce medium chain fatty acids and their respective ethyl esters in a synthetic nutrient medium was verified; amounts produced in 44 Italian wines were also analysed. A reliable, fast and effective method of extraction was used. There was a greater amount of fatty acids in white than in red wines; there was also a greater quantity produced in wines which underwent stuck fermentation, in comparison to those that fermented normally or were treated with charcoal. Fatty acid production was dependent on the yeast strain: almost no fatty acids were produced by *Zygosaccharomyces bailii* 1,

Kloeckera apiculata 1 and *Schizosaccharomyces japonicus* 5; *Saccharomyces cerevisiae* var. *cerevisiae* and *S. cerevisiae* var. *bayanus* produced large quantities (from 0.9 to 3.7 mg/l of C8); and *S. cerevisiae* var. *cerevisiae* 193 produced the greatest quantity (about 7 mg/l of C8). Acetaldehyde, acetic acid and pyruvic acid production was evaluated in 2 yeast strains. Linear regression analysis showed a correlation among caprylic acid, ethyl caprylate, ethyl caprate and acetic acid production. AA

1197

Herraiz (T), Huang (Z) and Ough (CS). **Amino acids and ethyl esters of amino acids in sparkling and 'sur lie' wines.** *Italian Journal of Food Science* 5(1); 1993; 11-20

The amount of amino acids and amino acid ethyl esters was determined in some sparkling wines and in table wines maintained in the presence of the yeast lees ('sur lie' wines). Results show an increase in both series of compounds with yeast contact. The ethyl esters of the amino acids increased during the secondary fermentation in sparkling wines. A greater amount of both proline ethyl ester and gamma-aminobutyric ethyl ester was observed in the older sparkling wines. AA

Non-alcoholic beverages

1198

McNeill (VL) and Schmidt (KA). **Vanillin interaction with milk protein isolates in sweetened drinks.** *Journal of Food Science* 58(5); 1993; 1142-1144, 1147

The impact of heat processing and emulsifier addition on the interaction of vanillin and sodium caseinate or vanillin and whey protein isolate was examined in a model system. Free vanillin in the protein drink was evaluated by a sensory panel and HPLC. Sensory analysis indicated that emulsifier, heat x protein and heat x emulsifier interaction significantly ($P < 0.05$) affected perception of vanillin flavour. Solutions with added egg yolk solids had highest vanillin flavour intensity. Heating caused a significant increase in vanillin flavour intensity in whey protein isolate, but not in sodium caseinate solutions. Analysis of free vanillin by HPLC indicated that sodium caseinate interacted more with vanillin than did whey protein isolate. No correlation was found between sensory and HPLC results. SRA

Fruit juices

Raspberry juices

1199

Boyles (MJ) and Wrolstad (RE). **Anthocyanin composition of red raspberry juice: influences of cultivar, processing, and environmental factors.** *Journal of Food Science* 58(5); 1993; 1135-1141

The anthocyanin and anthocyanidin pigment profiles of 46 authentic red raspberry juice (RRJ) samples were determined by HPLC. Total anthocyanin pigment content and % polymeric colour were also determined. This generated a database incorporating influences of cv., geographic origin, maturity, processing and fungal contamination. Cv. exhibited characteristic patterns distinguished by quantitative rather than qualitative differences. Total pigment ranged from 4 to 1102 mg/l. Commercial RRJ concentrates (14) were also analysed. 2 were shown to be adulterated because of the presence of delphinidin glycosides. 3 samples contained high amounts of polymerized pigments, indicating a history of processing or storage abuse. AA

FATS AND OILS

1200

Anon. **Pigmented codes for the food and beverage industry.** *Confectionery Production* 59(1); 1993; 66-67

Describes the use of Videojet's Excel P inkjet printer which can apply a range of pigmented inks to any surface, porous or non-porous, smooth or curved, at most required production line speeds (up to 916 ft/min). The printer delivers a clear, crisp and near letter quality, bright code on any dark surface. The operation of the new Videojet DigiMark Laser Coder (Version 3.15°C), which offers manufacturers indelible coding on to virtually any surface at

low cost, is also described. Its range of features and customer benefits are stressed. CSA

Oils

Flaxseed oils

1201

Ranhotra (GS), Gelroth (JA), Glaser (BK) and Potnis (PS). **Lipidemic responses in rats fed flaxseed oil and meal.** *Cereal Chemistry* 70(3); 1993; 364-366

In a 6-wk study, diets prepared with full-fat flax seed meal (FM), defatted-FM (restored to full-fat level with a hard fat or isolated flaxseed oil[FO]) or just FO were compared for their effect on blood lipid levels. Hypercholesterolaemic rats were used as the test model. FM greatly negated the adverse effect of hard fat (hydrogenated soybean oil) on serum total cholesterol (CH) and serum non high-density lipoprotein CH. FM also accentuated the CH-lowering effect of isolated FO. Liver CH levels were quite elevated, especially in rats fed the diet not containing FM. Liver lipid levels ranged between 16 and 31%. Serum triglyceride levels were in the normal range and no lowering effect due to FM or FO was observed. AA

Palm oils

1202

McNeill (GP) and Berger (RG). **Enzymatic glycerolysis of palm oil fractions and a palm oil based model mixture: relationship between fatty acid composition and monoglyceride yield.** *Food Biotechnology* 7(1); 1993; 75-87

In this paper changes in the glyceride fractions which occur during enzymic glycerolysis of palm oil-based fats were examined. Palm oil, palm stearin, palm olein and mixtures of palm stearin with rapeseed oil were reacted with glycerol at low moisture content using lipase from *Pseudomonas fluorescens* as catalyst. The content of monoglyceride (MG) in the reaction mixture at equilibrium was found to be higher at lower temp. except for palm stearin where a higher diglyceride (DG) content was obtained. High temp. GC analysis revealed that at lower reaction temp. the predominant reaction product was monopalmitin or, in the case of palm stearin, dipalmitin. Separation of the MG and DG fractions followed by detn. of the fatty acid composition showed that at higher reaction temp. the fatty acids were randomly distributed in these fractions, but at 30-40°C the saturated fatty acids were preferentially located in the MG fraction. A strong positive correlation was found between saturated fatty acid content and yield of MG at lower reaction temp. BV

SPICES AND CONDIMENTS

Spices

Saffron

1203

Tsimidou (M) and Tsatsaroni (E). **Stability of saffron pigments in aqueous extracts.** *Journal of Food Science* 58(5); 1993; 1073-1075

Effects of pH, light, temp. and O_2 on the stability of saffron (*Crocus sativus*) pigments (SP) in aqueous extracts were studied. First-order kinetics for degradation of SP under all experimental conditions (pH 3, 5 and 7; temp. 4, 25, 40 and 62°C; under light or dark conditions; in O_2 or reduced O_2 atm.) were observed. Kinetic data were calculated from the values of the colouring power of saffron aqueous extracts. BV

SENSORY EVALUATION

1204

Tamura (MS), Shoemaker (CF) and Henderson (JM). **Performance of the helical screw rheometer for fluid food suspensions.** *Journal of Food Science* 58(5); 1993; 1172-1175

A comparative study of the helical screw rheometer (HSR) measurements with those obtained from a rotational rheometer with cone and plate fixtures were performed to evaluate the accuracy and precision of the HSR. The HSR consists of a helical screw enclosed in a

tight fitting cylinder. When the screw is rotated with the system closed it generates a linearly increasing pressure differential along the axis of the screw. The pressure is proportional to the viscosity of a Newtonian fluid. Viscosity of standard Newtonian fluids measured using the HSR correlated well with measurements on a rotational rheometer with cone and plate fixtures. HSR data on non-Newtonian suspensions analysed with a power law model ($\sigma = m\gamma^n$) did not agree as well with results from cone and plate fixtures on the rotational rheometer. BV

FOOD STORAGE

Nil

INFESTATION CONTROL AND PESTICIDES

1205

Sorensen (AA). **Integrated pest management: Finding a new direction.** *Cereal Foods World* 38(4); 1993; 187-188, 190-192, 194, 196

Integrated pest management is being evaluated as an alternative to the current use of pesticides. Questions about certification, pesticide reduction targets, environmental and health risk assessments, and incorporation of HACCP principles are explained. CSA

1206

Kenkel (P), Criswell (JT), Cuperus (GW), Noyes (RT), Anderson (K), Fargo (WS). **Stored product integrated pest management.** *Food Reviews International* 10(2); 1994; 177-193

Review. 26 references. SRA

BIOCHEMISTRY AND NUTRITION

1207

Swarnkar (VK), Chouhan (AS) and Kushwah (RS). **Impact of instructional television programmes on women's knowledge and attitude towards nutrition and home practices.** *Madras Agricultural Journal* 81(2); 1994; 75-77

Two groups of women (1) viewed (50 women) and (2) non-viewed (50 women) of the age group 17-50 yr were selected randomly to compare the knowledge and attitude on nutrition, food preservation, food adulteration and health education. Overall impact of TV programmes on viewers was better than those of non-viewers. No specific role of sociopersonal and economic characteristics influenced the attitude of these 2 groups with respect to home and nutrition practices. GS

1208

Black (RM). **Sucrose in health and nutrition - facts and myths.** *Food Technology* 47(1); 1993; 130-133

The article clarifies the notions that sugar consumed in excess, contributes to hyperactivity and can lead to obesity, diabetes, cataracts, hardening of the arteries and other diseases are myths and not facts. CSA

1209

Mermelstein (NH). **Nutrition labelling in foodservice.** *Food Technology* 47(4); 1993; 65-68

Describes the labelling regulations as they pertain to food service operations and tells how the major foodservice chains are providing nutritional information to their customers. CSA

1210

Marcoe (KK) and Haytowitz (DB). **Estimating nutrient values of mixed dishes from label information.** *Food Technology* 47(4); 1993; 69-70, 72, 75

This article discusses a method which accurately calculates the nutrient value of a food without requiring complete analytical data. CSA

1211

Jenkins (MLY). **Research issues in evaluating "Functional foods".** *Food Technology* 47(4); 1993; 76, 78-79

The article provides a broad overview of some of the factors that may influence research studies on the nutritional efficacy and safety of functional foods and identifies some of the problems that may be encountered in conducting these studies. These factors include guidelines governing the execution of studies; experimental design; test substances and compounds (selection, characterization, suitable standards); stability, homogeneity and acceptable levels of test substances and compounds in diet; control of nutritional and other dietary variables; preparation of animals for euthanasia; and statistical evaluation. CSA

1212

Kurzer (MS). **Planning and interpreting "Designer food" feeding studies.** *Food Technology* 47(4); 1993; 80, 82-84

Human feeding study on the effects of flaxseed on estrogen exposure is discussed and it emphasizes the need for caution in making dietary recommendations. CSA

TOXICOLOGY

1213

Mohan (B) and Chandrasekaran (D). **Effect of aluminium silicate in ameliorating the toxicity of aflatoxin in commercial layers.** *Poultry Guide* 31(7); 1994; 37-39

Hydrated sodium calcium aluminosilicate when added to layer feed reduced the ill effects of aflatoxin B_1 and improved the performance of birds by maintaining the feed intake, egg production and reduced the incidence of breakage from 0.4 to 0.2% and leathery eggs. GS

FOOD LAWS AND REGULATIONS

1214

McNamara (SH). **FDA rules concerning 'light'/'lite' claims.** *Manufacturing Confectioner* 73(5); 1993; 47-49

1215

Seguine (ES). **Nutrition labeling. Nutrition Labeling and Education Act of 1990 (NLEA). Review of the final regulations published January 6, 1993.** *Manufacturing Confectioner* 73(3); 1993; 89-108

Provisions of the USA Nutrition Labeling and Education Act of 1990 are outlined and areas of particular concern to the confectionery industry are considered. Aspects covered include: effective date; label format; exemptions and special conditions; serving sizes and servings per container; daily values, DRVs, RDI and RDA; FDA compliance procedures for nutritional labels; compliance when using databases; CMA/NCA/RCI data base initiative; and other issues. CSA

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Printed and published by Director, Central Food Technological Research Institute, Mysore 570 013, at CFTRI Printing Press. Editor: Shri K. A. Ranganath, CFTRI, Mysore.